U.S. Army Research Institute
for the Behavioral and Social Sciences

Research Report 1733

Evaluation of Dismounted Infantry Simulation Technologies (E-DIST)

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14. ABSTRACT *(Maximum 200 words)*:

This report describes the assessment of five simulators that train dismounted infantry tasks. Subject matter experts (SMEs) worked through leader, soldier, or team scenarios and rated how well each simulator supported performance of subtasks related to military operations in an urban environment. The SMEs also identified characteristics to be considered for future simulators and modifications that would improve the current systems. The recommendations are the basis for characteristics to be considered in the Training Device Requirement for a Dismounted Infantry Module in the Close Combat Tactical Trainer.

15. SUBJECT TERMS

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FOREWORD

This report documents the Evaluation of Dismounted Infantry Simulation Technologies (E-DIST). These simulation technologies have been developed through Small Business Innovative Research initiatives as well as commercial development. The E-DIST project is part of the U.S. Army Research Institute (ARI) for the Behavioral and Social Sciences' ongoing research to establish innovative methodologies for training combined arms forces.

The E-DIST project was conducted to determine if technology could meet the existing Close Combat Tactical Trainer (CCTT) Dismounted Infantry Module requirement as stated in the CCTT Training Device Requirement. The project, performed under the oversight of the ARI Infantry Forces Research Unit, evaluated five technologies designed to train dismounted infantryman in a Distributed Interactive Simulation environment. The evaluation comprised six tasks and 64 subtasks determined to be representative of the tasks required to be trained in the Close Combat Tactical Trainer. The technologies evaluated included: Immersive Virtual Environment Prototyping and Simulation System TactX, Intelligent Tutoring System, Electronic Classroom, Dismounted Soldier Simulation, and Soldier Visualization Station. The project represents a continuing research effort to address an identified weakness in the training of dismounted infantrymen in virtual environments and to leverage emerging technology.

ZITA M. SIMUTIS
Technical Director

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EVALUATION OF DISMOUNTED INFANTRY SIMULATION TECHNOLOGIES (E-DIST)

EXECUTIVE SUMMARY

Research Requirement:

The Army has begun fielding Close Combat Tactical Trainer (CCTT), a training device that has been developed to train heavy forces in a virtual Distributed Interactive Simulation (DIS) environment. Although the CCTT Training Device Requirement (TDR) calls for the training of the dismounted infantry as part of heavy force operations, the training value for infantrymen has been limited. Recent technological advances make it possible to develop a Dismounted Infantry Module that comes closer to the goals set by the TDR.

Two programs have supported the Army's efforts to enhance DIS training for dismounted infantry: the Dismounted Warrior Network (DWN) and the Small Business Innovation Research (SBIR) Program. The DWN has included investigation of requirements for manned simulators to support the integration of the dismounted infantryman into the virtual battlefield. The result has been a series of engineering experiments and user exercises that demonstrated the practicality of virtual simulation technology applied to dismounted infantry tasks. The SBIR program is a Congressionally mandated effort to encourage small firms with strong research and development capability to apply emerging technology to solve Army problems. This project addressed the fundamental question: What tasks can be performed on selected SBIR and DWN simulators?

Procedure:

The general approach was to collect data from subject matter experts (SMEs) through a combination of structured task-support ratings and group interviews. Project staff developed forms for support ratings on tasks related to military operations in an urban terrain. The SMEs worked with each of the five systems and indicated which tasks were supported by each system. The SMEs then provided feedback on features of the systems that should be considered for future simulations and enhancements to the specific systems assessed.

Findings:

The SME ratings and comments on the technologies showed that each system included features that should be considered for further implementation. One personal-computer trainer showed the benefits of animation for training individuals on how to clear a room; another demonstrated a way to reinforce principles of controlling fire teams in a building. Three systems that immersed soldiers in the virtual environment included features especially relevant for the Dismounted Infantry Module. One system demonstrated ways to control teams and squads through voice commands and hand and arm signals. Another included an especially effective approach to precise individual movement in a virtual environment. The third immersive system

incorporated emerging Land Warrior technology. In addition to identifying the tasks that could be supported by each technology, the data collection identified potential requirements for the Dismounted Infantry Module.

Utilization of Findings:

The report will be provided to selected departments within the U.S. Army Infantry School and the U.S. Army Simulation, Training, and Instrumentation Command. The findings can be applied to the development of a training device requirement document for the Dismounted Infantry Module within CCTT.

EVALUATION OF DISMOUNTED INFANTRY SIMULATION TECHNOLOGIES (E-DIST)

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EVALUATION OF DISMOUNTED INFANTRY SIMULATION TECHNOLOGIES (E-DIST)

Introduction

Background

One way that the Army has responded to constrained training resources is through a strong commitment to distributed interactive simulation (DIS) as an adjunct to field environments for conducting collective training. That commitment has led to success in the training of mounted operations with Simulation Networking (SIMNET) (Shlechter, Bessemer, Nesselroade, & Anthony, 1995) and its successor--Close Combat Tactical Trainer (CCTT).

There has been less success in DIS applications for training dismounted infantry operations. The current CCTT fixed site set includes a Dismounted Infantry Module workstation, but few infantrymen are involved in the workstation--typically a platoon leader (PL) and two squad leaders (SLs) for a company/team operation. Further, the role of the operators is limited to representing movement of dismounted elements through the use of joysticks, buttons, and switches. This low level of immersion of dismounted infantrymen has resulted, not because the Army perceives the dismounted role as trivial, but because the number and complexity of models to represent Infantry combatants has, until recently, exceeded the capacity of affordable computing resources (Pleban, Dyer, Salter, & Brown, 1998).

The Army's intention to increase the quality of simulator support for dismounted infantry is shown in the CCTT Infantry Training Strategy (Reiss & Hubbard, 1995). The strategy emphasizes the need to implement high-resolution virtual simulations and simulators as the most resource-effective method for sharpening soldier and leader skills. The strategy recognizes that the initial fielding of CCTT will provide only a part-task trainer for a subset of infantrymen. But the goal is more ambitious: To include "the full spectrum of infantry, weapons platforms, dismounted combatants and dynamic terrain to involve dismounted infantry leaders and ultimately each dismounted platoon member and attachment" (Reiss & Hubbard, 1995, p.22).

Two programs that have supported the Army's efforts to enhance DIS training for dismounted infantry include the Dismounted Warrior Network (DWN) and the Small Business Innovation Research (SBIR) Program. The DWN program has included investigation of requirements for manned simulators to support the integration of the dismounted infantryman into the "virtual battlefield." The result has been a series of engineering experiments and user exercises that demonstrated the practicality of virtual simulation technology applied to dismounted infantry tasks (Lockheed-Martin Information Systems, 1997; Pleban et al., 1998).

The SBIR Program is a Congressionally mandated effort to encourage small firms with strong research and development capability to apply emerging technology to solve Army problems (Reiss, 1995). A typical SBIR program starts with the presentation of a concept and, if the concept is feasible, development of a prototype. Prototypes developed for three concepts for DIS training of dismounted infantrymen were assessed in this project.

Technical Objectives

The project described in this report addressed two technical objectives:

- Estimate the training effectiveness of selected DWN and SBIR projects in training dismounted infantry tasks.

- Determine capabilities to be included in a training device requirement document for a module to train dismounted infantry tasks in a virtual-reality-training environment.

Method

The domain of training effectiveness assessment for simulators such as the SBIR and DWN projects can address a variety of related questions that require increasingly complex designs to answer (Hoffman & Morrison, 1992). This project addressed the fundamental question: What tasks can be performed on selected SBIR and DWN simulators? This is the appropriate question for systems that are in the process of development. The underlying assumption for the approach was that training effectiveness is dependent upon how realistically the training environment represents the operational environment.

The general approach for the assessment was to collect data from subject matter experts (SMEs) through a combination of structured task-support ratings and group interviews. To implement this approach, project staff developed forms for task-support ratings based on current publications and submitted the analyses to the U.S. Infantry School (USAIS) Directorate of Operations and Training (DOT). After revisions resulting from the DOT review had been implemented, a set of SMEs worked with each of five systems. They indicated which tasks were supported by the system and, after working with each system, provided feedback on features of the systems that should be considered for future simulations, in particular the Dismounted Infantry Module in CCTT. They also suggested enhancements to the specific systems assessed. This section describes the systems, schedule, SME qualifications, and data collection instruments.

Systems

The assessment considered four separate systems, and three variations of another system. Three systems were developed as part of the SBIR program; the remaining two systems were prototypes from the DWN program.

Immersive Virtual Environment Prototyping and Simulation System (IVEPSS) TactX. The specific IVEPSS system evaluated was the TactX Simulator--an interactive virtual environment system oriented on tactical skills as performed by ground force leaders (Nemire, 1998). Interactions are conducted through a combination of speech commands, arm signals, and hand gestures. The three-dimensional computer generated terrain is presented through a head-mounted display that gives the combatant a 360-degree view. The combatant controls semi-autonomous computer-generated forces (CGF) through a combination of verbal commands and an instrumented glove. Figure 1 shows an instrumented soldier during the orientation/calibration

phase. In the scenario, the leader controlled two teams in a squad. Tools included a map, binoculars, radio, weapons, and the global positioning system (GPS).

Figure 1. Soldier in TactX with helmet-mounted display and instrumented glove.

Intelligent Tutoring Simulation. The Intelligent Tutoring Simulation (ITS) is a desktop computer system that combines two personal computers to present views of fire teams clearing a one-story building. One computer is controlled by the fire team leader through keyboard or mouse commands and supports implementing clearing procedures; for example, stacking outside the door, options in breaching the door, and marking the room. The squad leader controls the second computer to coordinate teams; for example, move out and post security. The squad leader can monitor performance of the fire team leader. As the name implies, ITS provides feedback on selected errors during the exercise and includes a replay capability to support an after-action review (AAR).

Electronic Classroom. The Electronic Classroom (eClass) is an automated tutoring system that is presented over the Internet to provide basic instruction on building clearing procedures (Mazzu, Jones, Pullen, Luhmann, Das, & Zacharias, 1997). Soldiers select topics related to clearing a building depending on the room configuration, such as center door or corner door; formation within the hall, such as serpentine or rolling-T; type of intersection, such as T-shaped or corner; and, option for breaching the door with a weapon, doorknob or hinge. The tutoring system presents text from current field manuals and, for most topics, gives soldiers the option of viewing animated examples of the technique.

Dismounted Soldier Simulation. The Dismounted Soldier Simulation (DSS) immerses individual infantrymen in a virtual environment. Body sensors attached to the soldier's boots, body, and rifle control individual movement within the virtual environment. The sensors represent direct body movement within an 8 ft by 8 ft motion capture area that corresponds with a 64 sq. ft section of the virtual environment. Soldiers view the environment through a wireless helmet-mounted display. The instrumented soldier is shown in Figure 2. Soldiers fire the rifle, SAW, machine gun, or anti-tank weapon by aiming and firing a simulated M16 rifle.

Figure 2. Soldier in DSS with sensors, M16 rifle, and helmet-mounted display.

Soldier Visualization Station. The Soldier Visualization Station (SVS), made by Reality by Design, Inc., is also a virtual environment simulator directed toward individual combatants. The assessment considered three configurations of the SVS: (a) the base system, (b) a panoramic display option, and (c) a configuration where movement is controlled by a treadmill.

The base version of SVS projects a virtual environment terrain display on a flat screen. A thumb switch on a realistic replication of the M4, Land Warrior rifle controls movement. The thumb switch functions like a joystick to control direction and rate of movement. In the base system, the display is sensitive to the actual posture of the soldier being trained, for example, standing, kneeling, and prone. The system is configured to simulate Land Warrior technology, which incorporates a weapon-mounted video camera that feeds to the Integrated Helmet Assembly Subsystem (IHAS) display. The base system is shown in Figure 3.
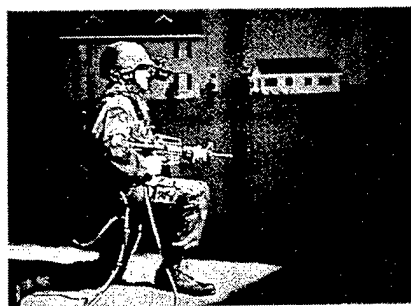

Figure 3. Soldier in SVS with M4 rifle, IHAS, and flat-projection screen.

The second system, similar to the base system, uses a parabolic dome display instead of a flat screen. The distinctive characteristic of the treadmill configuration is that an omni-directional treadmill, which occupies an 8 x 8-ft space on a platform, controls soldier movement. Two other differences from the basic system are that the virtual environment is presented on a head-mounted display and a thumb switch controls kneeling and prone positions.

Schedule

The first data collection took place over two days during March 98, with the assessment of TactX, ITS, and eClass. Six SMEs supported that phase. Three worked with the TactX on the first day while the others worked with the ITS then eClass systems. On the second day, the SMEs switched systems.

For TactX, manufacturer representatives presented an approximately one-hour orientation to the system, including calibration. They then monitored each SME during the conduct of a squad assault in open terrain.

For ITS and eClass, a member of the project staff first oriented the SMEs to the ITS system. Each SME then operated the team leader and squad leader modules until he understood what the system could do. As they finished ITS, SMEs began to work through eClass at their own pace.

Data collection for DSS and the SVS variations was conducted about one month later. In these assessments, SMEs worked as two-man teams on parallel systems to perform military operations in an urban terrain (MOUT) data base built to model the McKenna MOUT Site at Fort Benning. In the scenario, a team assaulted a building, cleared a room containing a sniper, moved upstairs, and defended the building under daylight and night conditions. Adjacent friendly teams and opposing forces (OPFOR) were provided through semi-automated forces.

On the first day, the parallel systems were the DSS and the base SVS. On the second day, the parallel systems were the SVS with the panoramic projection and the SVS with the omni-directional treadmill. All SMEs were first oriented to the SVS in the panoramic configuration. The initial orientation was conducted by staff at the Dismounted Battlespace Battle Lab (DBBL) Simulation Center who introduced the basic control modes within SVS and the scope of the MOUT database. Before each DSS assessment trial, manufacturer representatives calibrated the DSS and familiarized the SME with the simulator features. Staff in the DBBL Simulation Center conducted the orientation to the treadmill. Calibration required about 30 minutes per SME per system.

Subject Matter Experts

Over the two assessments, a total of seven SMEs contributed: two officers awaiting the start of the Infantry Officer Advanced Course, the ARI Research and Development (R&D)

Coordinator, and four NCOs from the USAIS who conduct MOUT training. All SMEs had at least two years' experience with training MOUT in units. Three of the NCOs had experience with MOUT under combat conditions. Two of the NCOs participated in both data collection phases.

Instruments

The SMEs provided assessment data through three approaches: (a) subtask ratings, (b) simulation feature ratings, and (c) system enhancement recommendations.

Subtask Ratings. The primary intent of the assessment was to identify specific dismounted infantry subtasks that can be supported by each system. The task domain selected was MOUT because that environment presents the greatest variety of challenges for simulating dismounted infantry operations. As a result, simulator features that are effective for MOUT will probably also be effective for other environments.

Six tasks with multiple subtasks were identified for the ratings. The scope and sources of information for the tasks are described below:

Task 1. Perform Movement Techniques in MOUT (8 subtasks):
(a)   PL directs formation and movement technique appropriate for METT-T
(b)   Routes and techniques provide cover from most likely enemy positions
(c)   Platoon formations and techniques provide security and enhance control
(d)   Squad formations provide security and enhance control
(e)   Fire team formations provide security and enhance control
(f)   Individual soldier movement maximizes cover and concealment
(g)   Platoon reacts to sniper fire
(h)   Soldiers take hasty firing positions
Collective movement techniques were drawn from FM 7-7J [U.S. Department of Army (DA), 1993a]. Individual movement and firing positions were based on FM 90-10-1 (DA, 1993c), particularly Chapter 5, Fundamental Combat Skills, Section I--Movement. The description of options for reacting to sniper fire was drawn from Appendix J of FM 90-10-1--Countering Urban Snipers.

Task 2. Assault Element Assaults the Objective Building (7 subtasks):
(a)   SL designates entry point
(b)   SL designates route to entry point
(c)   Assault element or supporting weapons blow entrance through wall
(d)   If entry point requires, assault element enters upper story of building
(e)   Assault element enters building
(f)   SL marks the entry point
(g)   Team covers staircases and other routes leading to upper and lower stories
The main reference was FM 90-10-1, Chapter 5, Section II--Entry Techniques (DA, 1993c).

Task 3. Support Element Provides Fire Support for the Assault Force Entry of Building
(8 subtasks):

(a)   SL assigns each soldier and key weapon a target or area to cover

(b)   Support element maintains continuous communications with and observation of the assault element.

(c)   Support element suppresses/kills enemy within the objective building and adjacent buildings

(d)   SL repositions soldiers and weapons, if necessary, to prevent withdrawal, reinforcement, or counter attack

(e)   During the assault, the support element maintains suppressive fire

(f)   During the assault, the support element obscures the enemy position with smoke

(g)   Just before the assault element enters the objective building, the support element increases the rate of fire until masked by the assault element

(h)   When the assault element enters the building, the support element shifts fires to adjacent buildings and the level of the objective building not being entered; for example, enter high/suppress low.

Techniques are documented in Battle Drill 5. Enter Building/Clear Room from FM 7-8 (DA, 1992b) and two training and evaluation outlines (T&EOs) in ARTEP 7-7 J-MTP, (USAIS, 1997)--Perform Overwatch/Support By Fire (7-3/4-4108) and Clear a Building (7-3/4-4110).

Task 4. Assault Element Clears the Objective Building (14 subtasks):

(a)   Assault element clears stairs

(b)   Team clears hallways

(c)   SL directs the assault element first to clear the rooms that overlook approaches to the building

(d)   SL coordinates with other squads to be sure that friendly forces are not in adjacent rooms

(e)   Soldiers line up as close to the entry point as possible

(f)   Soldier breaches wall with demolitions (vice breaching the door)

(g)   Soldier breaches door with demolitions (alternatives)

(h)   Soldier breaches door with weapon (alternative)

(i)   Four-member fire team enters the room

(j)   Soldiers apply close-combat techniques

(k)   Soldiers apply close combat techniques under limited visibility conditions

(l)   Mark cleared room

(m)   SL rotates fire teams as necessary

(n)   After all rooms have been cleared, squad consolidates and reorganizes

The primary reference was FM 90-10-1 (DA, 1993c), especially Appendix K--Close Quarters Combat Techniques--and information on breaching with demolitions from Appendix M--Field-Expedient Breaching of Common Urban Barriers. Further information on team actions was drawn from Battle Drill 5 (DA, 1992b). The T&EO for Clear a Building (USAIS, 1997) was the main basis for leader decisions.

Task 5. Defend a Building during MOUT (Daylight) (12 subtasks):

(a)   PL designates area for observation post (OP); squad leader selects specific
         position
(b)   Platoon installs tactical obstacles, to include protective wire
(c)   PL develops fire support plan
(d)   PL assigns sectors of fire, engagement priorities, and fire control measures
(e)   Soldiers select fighting positions
(f)   Gunners prepare range cards
(g)   Squad leaders prepare squad sector sketches
(h)   PL prepares platoon sector sketch
(i)   Soldiers prepare defensive positions
(j)   Platoon engages enemy
(k)   Platoon continues to defend or PL requests permission to withdraw
(l)   Platoon consolidates and reorganizes

Leader decisions and controls were based primarily on T&EO 7-3/4-4118--Defend MOUT/Building (USAIS, 1997). Actions for individual positions were drawn mainly from FM 90-10-1, Chapter 5, Section III -- Firing Positions (DA, 1993c).

Task 6. Defend a Building during MOUT (Night) (adds 6 subtasks to Task 5):
(a)   PL positions listening posts (LPs) and directs patrols into open areas covered by
         observation during daylight
(b)   Weapons move to alternate positions
(c)   Gunners mark TRPs for limited visibility, to include glint tape, thermal tape,
         budd lights, and chemlites
(d)   Platoon emplaces early warning devices
(e)   Platoon engages enemy under limited visibility conditions

The primary reference was Appendix I, Limited Visibility Operations under MOUT Conditions, in FM 90-10-1 (DA, 1993c).

Of the multiple subtasks identified, 18 were analyzed further to identify supporting activities. For example, the subtask covering hasty firing positions includes four activities to reflect unique positions at the corner of a building, from behind a wall, from a window or loophole, or from the roof.

For most military tasks, performance requires a combination of physical and cognitive skills. Because a given simulator might support cognitive requirements differently than it supports physical requirements, SMEs considered each type of requirement separately. To support that distinction, the staff analyzed each subtask and activity to determine whether performance in an operational environment required physical demonstration of a technique, application of a rule, making a decision based on several variables, or a combination.

- Demonstration of a technique involves applying a procedure to complete a subtask or activity. For example, the subtask for breaching a door with a weapon includes an activity that gives combatants the option of firing a shotgun. Systems that include a shotgun that will breach a door support the technique.

- <u>Rule</u> application involves implementing items of information. For example, assume that a simulator supports the technique of breaching a door with a shotgun. The combatant still must know where to aim the shotgun and how many rounds to fire. Systems that allow the door to collapse regardless of where the blasts hit do not support the rule application.

- <u>Decision-making</u> involves weighing several items of information to apply a principle. For example, a squad leader who selects an entry point should consider the height the squad can scale, time available, and amount of cover. In order to support decision-making, a system would need to provide a variety of conditions and options for responding to the conditions.

The analysis showed that most subtasks/activities require demonstration of a technique and either application of a rule or decision making. For example, the subtask on fire team formations requires techniques of moving in wedge, column, and file formations plus application of rules on positions and dispersion in each formation. Selection of the formation and route is treated as a separate decision-making subtask for the leader, who weighs considerations for directness and potential threat from the various buildings.

Each SME provided information on each relevant requirement for each subtask or activity. Factors that SMEs should consider were listed for most subtasks/activities and for all rules and decisions. The Subtask Rating Form is included as Appendix A and illustrated by the extract in Figure 4. [Table 1 explains the rating scale found in Figure 4.]

Task 2: Assault Element Assaults the Objective Building

Subtask/Activity [Scope]	Technique	Rule	Decision
2A. SL designates entry point [Highest point that squad can enter quickly and under cover]		2 1 0 -1 -2 [avoid doors, windows]	2 1 0 -1 -2 [height, cover, speed]
2B. SL designates route to entry point		2 1 0 -1 -2 [approach from enemy flank or rear]	2 1 0 -1 -2 [directness, cover and concealment]
2C. Assault element or supporting weapons blow entrance through wall	2 1 0 -1 -2		
2D. (If entry point requires) Assault element enters upper story of building			
Gain access to entry point using ladders	2 1 0 -1 -2		
Gain access to entry point using ropes and grappling hooks	2 1 0 -1 -2		
Gain access to entry point by rappelling from the roof	2 1 0 -1 -2		

Figure 4. Extract from Subtask Rating Form.

The SMEs rated how well each simulator could support performance of each relevant requirement of each subtask/activity using the scale in Table 1. The rating scale was an

adaptation of the scale for Training Performance Codes (SHERIKON, 1995). The major difference was that the possibility of negative training was explicitly addressed. For this analysis, negative training was predicted when combatants were forced to perform inappropriately or were prohibited by the technology from performing an important technique. For example, a system that allowed only one rate of fire with a weapon might have a negative impact on the training of suppressive fire subtasks, because units could not vary their rates of fire.

Table 1

Rating Scale for Techniques, Rule Applications, and Decision-Making

Rating	Value	Definition
Highly Supported	2	Cues are sufficient to call for the full response and the response is accurate.
Moderately Supported	1	Cues are sufficient to call for most of the response and the response is accurate.
Not Supported	0	A significant number of essential cues are not provided or the accurate response is not allowed.
Moderately Negative Training	-1	Missing cues or response limitations may result in incorrect responses that reduce combat effectiveness.
Highly Negative Training	-2	Missing cues or response limitations are likely to result in incorrect responses that reduce combat effectiveness.

Simulation Feature Ratings. After all SMEs had worked with each system covered in a session, they rated the impact of selected features of the conditions or response modes for the systems. The SMEs considered whether features such as the voice command menu in TactX added, were neutral, or detracted from training. The Simulation Feature Rating Forms are included as Appendix B.

Simulator Enhancement Recommendations. The last data collection activity was a group interview regarding enhancements for each system. In the interview, each SME recommended ways that each system could be improved. Following discussion to clarify the intent of each recommendation, SMEs indicated their individual levels of agreement.

Results

The data collection provided SME feedback on three questions for each system: (a) What subtasks can the system support? (b) What features of the system should be considered for future simulations? And (c) what changes are needed to improve the current system? This section describes each type of feedback for each system, with emphasis on the subtasks supported.

The SME ratings of how well the system supported each requirement were the basis for determining which subtasks the simulators could support. Project staff calculated the mean values for each requirement by subtask. These results are included in Appendix C. This section discusses subtasks that were consistently identified as supported to a moderate or high degree. For the purpose of discussion, the criterion for moderate or high support was set at a mean support rating of .68 or higher.

The distribution of subtasks that met the criterion for support in at least one requirement is shown in Table 2. Much of the distribution relates to the scenarios used to assess the systems. The TactX scenario was an assault in open terrain; the SMEs rated its support of movement and direct fire support subtasks highly but were unwilling to assume that the approach would support subtasks performed in a building. Conversely, SMEs credited the other systems with support of subtasks in the assault and clearing of the building, but infrequently for tactical movement and direct fire support. None of the systems supported defense well; soldiers could did not construct firing positions or obstacles and the systems did not include realistic characteristics and effects of the variety of weapons required in a defense.

Table 2

Number of the 55 Subtasks Supported by Task and System

Task	TactX	ITS	EClass	DSS	SVS
1. Perform Movement Techniques in MOUT	7	1	NA	2	1
2. Assault Element Assaults the Objective Building	2	0	NA	4	3
3. Support Element Provides Fire Support for the Assault Force Entry of Building	4	0	NA	0	0
4. Assault Element Clears the Objective Building	1	6	6	5	4
5. Defend a Building during MOUT (Daylight)	0	0	NA	1	0
6. Defend a Building during MOUT (Night)	0	0	NA	0	0

TactX

The subtasks supported by TactX, shown in Table 3, relate mainly to the control of squads and fire teams, especially during tactical movement. The SMEs considered TactX to be effective in supporting leader performance, as evidenced by the ratings for applying rules and

making decisions about selecting routes, entry points, and firing positions. The ratings for subtasks under Task 3 are notable because TactX is the only system that SMEs thought had demonstrated a capability for realistic direct fire support. Probably because the TactX scenario did not include operations inside a building, consolidation and reorganization was the only subtask from clearing the building to meet the criterion for support.

Table 3

Mean Ratings for the 14 Subtasks Supported by TactX

Subtask	Technique	Rule	Decision
1(a) PL directs formation and movement technique appropriate for METT-T			1.33
1(b) Routes and techniques provide cover from the most likely enemy positions			1.17
1(c) Platoon formations provide security and enhance control	1.00	1.00	
1(d) Squad formations provide security and enhance control	1.50	1.17	
1(e) Fire team formations provide security and enhance control	1.70	1.17	
1(g) Platoon reacts to sniper fire	.50	.50	.70
1(h) Soldiers take hasty firing positions	.54	.75	
2(a) SL designates entry point		.83	.83
2(b) SL designates route to entry point		1.17	1.00
3(b) Support element maintains continuous communications with and observation of the assault element	1.00		
3(c) Support element suppresses/kills enemy within the objective building and adjacent buildings	1.00	1.00	
3(d) SL repositions soldiers and weapons, if necessary, to prevent withdrawal, reinforcement, or counter attack			.83
3(h) When the assault element enters the building, the support element shifts fires to adjacent buildings and the level of the objective building not being entered (for example, enter high/suppress low)	.83		1.00
4(n) After all rooms have been cleared, squad consolidates and reorganizes	.53	.83	

Several features were identified as promising for future simulations. The desirable features included tools that TactX made available: binoculars, compass, GPS, virtual radio, and pyrotechnics. The SMEs also commended the inclusion of low visibility conditions and requirements for casualty reports.

The most positive opinions were for the way that TactX enabled leaders to control squads and teams. Three methods were available: a laser-point technique, hand and arm signals, and speech commands. The laser-point technique gave the leader the option of designating a location to which the team or squad moved without further control. The SMEs also found that the CGF could be controlled reliably with signals for halt, spread out, close up, and wedge formation. The TactX approach to speech commands is illustrated in Figure 5. The commands are listed in the upper left corner. In the figure, the engage command is activated. Available options involve control of the full squad or a team. When the combatant gives a command, a TactX feature provides feedback in the form of a computer-generated restatement. If a command has been misinterpreted, the combatant can use the "Negative That" protocol. The menu feature is an unobtrusive way to simplify voice recognition and helped the SMEs maintain awareness of the status of the operation.
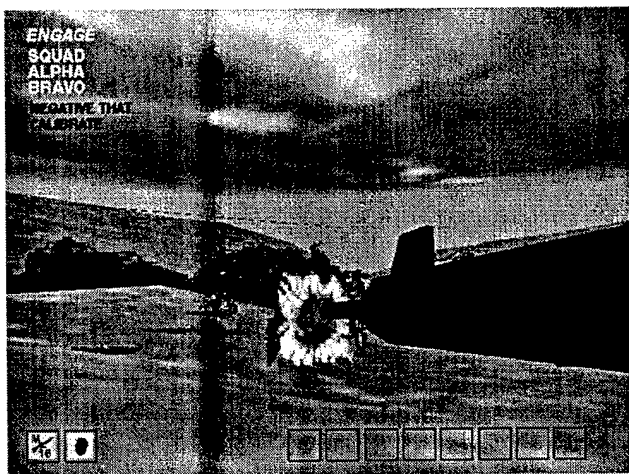
Figure 5. Combatant display in TactX with command menu.

The recommended enhancements to TactX are shown in Table 4, in order of the strength of agreement among the SMEs. The general theme of the recommendations is to increase the realism of the simulation--expanding the sources of fire, increasing the fidelity of firing techniques by including a fully functional rifle rather than a pointing software protocol, and making the OPFOR position more representative.

Table 4

Recommended Enhancements to TactX

Recommended Enhancement
Incorporate other direct fire (e.g., Bradley)
Objects need to be solid
Incorporate control of the M16 rifle
Incorporate indirect fire
Allow squad to fire if enemy is not within range
Increase realism of the objective (e.g., obstacles)
Allow lifting or shifting of direct fire
Add bounding capability to movement techniques
Up-grade map so it is suitable for route reconnaissance
Add wind effects on smoke
Increase options on limited visibility
For MOUT, include blueprint for building

Intelligent Tutoring Simulation

The terrain for the ITS exercises was the interior of a one story building, where a fire team clears hallways and rooms. As a result, SMEs were reluctant to project support for subtasks in the movement, assault, or defense tasks. As shown in Table 5, the only subtask from those tasks that meets the support criterion concerns fire team formations. All other subtasks supported by ITS relate to clearing a building. Those subtasks cover the techniques and rules for coordination among team members as they maneuver on one floor and clear individual rooms. The SMEs did not identify any decisions supported by the simulator, which probably reflects the limited complexity in the scenarios—for example; there are no windows or stairs. Subtasks regarding communication with other teams and monitoring the location of the team were down-rated because some SMEs thought that the overview option made the subtasks too simple.

Table 5

Mean Ratings for the 7 Subtasks Supported by ITS

Subtask	Technique	Rule	Decision
1(e) Fire team formations provide security and enhance control	.83	.83	
4(b) Team clears hallways	1.08	1.08	
4(e) Soldiers line up as close to the entry point as possible	1.00	1.00	
4(h) Soldier breaches door with weapon	1.33	1.17	
4(i) Four-member fire team enters the room	.81	.87	.67
4(l) Mark cleared room	1.33		
4(m) SL rotates fire teams as necessary	.83		.67

According to the SMEs, three instructional features of ITS ought to be considered for future systems. The first is the capability of replaying an operation, which the SMEs considered to be a support for AARs. The second desirable feature is remediation, which detects mistakes and gives corrective feedback. The third feature is the choice of view that gives trainers the option of seeing the virtual environment from the same perspective as the combatants or an overview of the complete floor. This is the same feature that SMEs criticized when it was provided for the combatants. Their point was that the option should only be available to the trainer.

The enhancements recommended for ITS are summarized in Table 6. The thrust of these recommendations is to increase the tactical complexity of the programmed exercises. SMEs recommended increasing variability in building characteristics, non-combatants, and casualties so that leader decisions such as how to organize teams are more meaningful.

Table 6
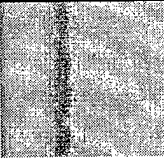
Recommended Enhancements to ITS

Recommended Enhancement
Need to have entire building (at least 2 floors)
Limit access to "top view"
Include consolidation and reorganization
Include non-combatants
Include options for 3-man and 2-man teams
Involve full platoon leadership (add PL)
Team must incur casualties
Increase realism of the building, add windows
Add capability of placing enemy within the room
Focus on leader tasks: select entry point
Do not force soldier through middle of room
Include weapon selection: shotgun, SAW
Give leader option to task organize
Include booby traps

Electronic Classroom

Because the eClass materials were instruction addressing specific tasks within a building, SMEs considered only the 14 subtasks involved in clearing a building. Even though the simulation in eClass is relatively unsophisticated, SME ratings showed support for a high proportion of subtasks. The supported subtasks in Table 7 involve individual and team performance, rather than leader decisions.

Table 7

Mean Ratings for the 6 Subtasks Supported by eClass

Subtask	Technique	Rule	Decision
4(b) Team clears hallways	1.25	1.25	
4(e) Soldiers line up as close to the entry point as possible	1.17	1.17	
4(g) Soldier breaches door with demolitions	.83	.33	
4(h) Soldier breaches door with weapon	1.50	1.33	
4(I) Four-member fire team enters the room	1.06	1.20	1.00
4(j) Soldiers apply close-combat techniques	.87	.58	.83

The only eClass feature that SMEs cited as desirable for other similar systems was animation. In recommending enhancements, SMEs took the perspective that the simulator would be used for entry level training. Their recommendations, therefore, were directed at including information that novices need: color-coded fields of fire, instruction on aiming techniques and sight pictures, an option to slow the pace, and expanded instruction to include a variety of room configurations.

Dismounted Soldier Simulation

As shown in Table 8, SMEs considered the DSS to be especially effective in the support of individual movement subtasks. Ratings for subtask 1(f)—Individual soldier movement maximizes cover and concealment--were reduced because the system did not include smoke or obstacles and did not allow movement over rooftops, but control of movement was highly supported. The capability of DSS to reflect precise movement is reflected further in lining up as close to the entry point as possible and entering the room as a team. The support for entering the room was reduced because of the absence of a grenade option and lack of booby traps, but the SMEs considered the key physical requirement of "button hooking" into the room to be well supported.

Table 8

Mean Ratings for the 12 Subtasks Supported by DSS

Subtask	Technique	Rule	Decision
1(f) Individual soldier movement maximizes cover and concealment	1.00	1.00	.33
1(h) Soldiers take hasty firing positions	1.08	.83	
2(a) SL designates entry point		1.00	.67
2(b) SL designates route to entry point		1.33	1.33
2(c) Assault element or supporting weapons blow entrance through wall	1.33		
2(e) Assault element enters building	.80	0.00	1.13
4(c) SL directs the assault element first to clear the rooms that overlook approaches to the building		1.00	
4(e) Soldiers line up as close to the entry point as possible	1.67	1.67	
4(h) Soldier breaches door with weapon	1.67	1.00	
4(I) Four-member team enters the room	.89	1.00	1.00
4(j) Soldiers apply close-combat techniques	1.33	1.17	1.67
5(e) Soldiers select fighting positions	1.00	.78	

The SMEs were also favorable to the firing techniques in DSS, as shown by the support for breaching a door with a weapon, applying close-combat techniques, and selecting fighting positions during a defense. That favorable opinion was due largely to the accurate replication of the M16 rifle and similarity of firing techniques. The support for selecting firing positions resulted largely from giving combatants the option of selecting machine gun or anti-tank weapon effects when firing the M16.

The SMEs agreed that three features were highly important. The first feature is a realistic rifle; SMEs were adamant that simulations of dismounted operations should include the infantryman's primary weapon rather than a "finger-point" simulation. They also agreed about the importance of supporting actual firing positions, to include kneeling and prone positions. The positive opinion of the DSS procedure for capturing precise movement was reflected in their agreement that a similar feature ought to be extended.

Three of the four recommendations for enhancing DSS were intended to enhance the support of precise movement. The SMEs wanted a larger movement-capture area, preferably to allow combatants to cross from the door to a corner without having to be repositioned. A related recommendation was for a way to notify soldiers when they approach the edge of the capture area. A third recommendation was to explore ways that more than one combatant might be in the capture area so they could use non verbal communication; for example, touch another combatant's shoulder to indicate readiness. The remaining recommendation was to provide realistic replicas of alternative weapons rather than using the rifle for all firing.

Soldier Visualization Station

The support for subtasks for the base version of SVS is summarized in Table 9. The ratings were affected negatively because the SMEs were not familiar with the Land Warrior technology. For example, the weapon-mounted video camera allows, and SVS requires, combatants to look around a corner by extending the barrel of the rifle. The SMEs acknowledged that such a technique will probably become doctrinal, but it violates a principle emphasized in current training, and included on the Subtask Rating Form, that soldiers should keep their weapons away from an intersection and extend their heads briefly to observe. As stated by one SME, "nothing in nature looks like a rifle barrel." Similarly, the SMEs were not familiar with the Land Warrior prototype rifle in general or firing techniques using the IHAS reticle display in particular, so they tended to down-rate firing subtasks.

Table 9

Mean Ratings for the 8 Subtasks Supported by SVS (Base)

Subtask	Technique	Rule	Decision
1(h) Soldiers take hasty firing positions	1.00	1.00	
2(a) SL designates entry point		1.00	1.00
2(b) SL designates route to entry point		1.33	1.33
2(e) Assault element enters building	.53	.17	.89
4(c) SL directs the assault element first to clear the rooms that overlook approaches to the building		1.00	
4(e) Soldiers line up as close to the entry point as possible	1.00	1.00	
4(h) Soldier breaches door with weapon	1.33	.67	
4(j) Soldiers apply close-combat techniques	.93	.83	1.17

The impact of the panoramic display option is shown in Table 10. The lower support for rules related to selecting the entry point and the sequence of rooms to be cleared resulted from a temporary malfunction unrelated to the panoramic display. At the time of the assessment, a flaw in the database had eliminated the ability to blow an entry hole in the wall, so the SMEs had to enter through the door, which also restricted the options in rooms to be cleared. Otherwise the ratings are very similar to the base version, with slight increases in the support entering the building, clearing hallways, and applying close combat techniques.

Table 10

Mean Ratings for the 7 Subtasks Supported by SVS (Panoramic)

Subtask	Technique	Rule	Decision
1(h) Soldiers take hasty firing positions	.83	.83	
2(b) SL designates route to entry point		1.00	1.00
2(e) Assault element enters building	.73	.17	1.00
4(b) Team clears hallways	.83	.83	
4(e) Soldiers line up as close to the entry point as possible	1.00	1.00	
4(h) Soldier breaches door with weapon	1.33	.67	
4(j) Soldiers apply close-combat techniques	1.07	1.17	1.00

While the treadmill variation of SVS was successful in eliciting the exertion inherent in MOUT, the SMEs did not consider the subtasks associated with movement to be well supported. Table 11 shows that the use of the treadmill resulted in lower levels of support for individual movement than the thumb switch applications, with three subtasks that were supported by both of the other variations not meeting the selection criterion. Taking hasty firing positions was rated low because the treadmill did not support actual kneeling or prone positions. SMEs also struggled with controlling precise movements on the treadmill, resulting in relatively low ratings of support for entering the building and lining up close to the entry point. The SMEs reported that when they moved quickly to a position and stopped suddenly, the treadmill would often reset to keep them from falling off the platform. The resetting not only moved the SME to the center of the treadmill, but also artificially moved the combatant in the simulation.

Table 11

Mean Ratings for the 3 Subtasks Supported by SVS (Treadmill)

Subtask	Technique	Rule	Decision
4(c) SL directs the assault element first to clear the rooms that overlook approaches to the building		1.00	
4(h) Soldier breaches door with weapon	1.00	.67	
4(j) Soldiers apply close-combat techniques	.93	.83	1.00

Most of the SME recommended features for DSS were also cited for SVS, specifically a realistic rifle and support of actual firing positions. The distinctive characteristic for SVS was the demonstration that emerging Land Warrior technology could be incorporated in the simulation.

From a negative perspective, the SMEs agreed that the treadmill as it operated in the assessment was not a useful feature. This finding is counter to an earlier assessment (Pleban et al., 1998) with less experienced soldiers who were much more positive about the treadmill variation. To some extent the difference may reflect a resistance to change among the SMEs in this project, but at least part of their rationale may generalize to other applications. The SMEs thought that the treadmill complicated the performance of a simple requirement at the expense of

more skilled behavior. In this case, running to the wall and stopping by the opening was so difficult that it detracted from the support of subtasks such as entering the building in coordination with other team members.

In addition to the recommendation to eliminate the treadmill, the SMEs suggested two SVS-specific enhancements: Add the capability of a 360-degree view and add weapon capabilities for the SAW, shotgun, and AT4

Besides enhancements specific to either the DSS or SVS system, SMEs recommended enhancements that applied to both systems. These recommendations are presented in order of agreement in Table 12. The recommendations called for increased tactical options and more realistic interaction with the database. Recommendations for tactical options included having more weapons and hand grenades available, a variety of OPFOR, and ability to climb. More realistic interactions with the database included solid objects, ability to mark rooms that have been cleared, and more choice in the selection of entry points.

Table 12

Recommended Enhancements to DSS and SVS

Recommended Enhancement
Make objects solid
Adjust OPFOR lethality to reflect crawl-walk -run progression
Add hand grenades
Increase options for entry point
Add capability for combatant to climb
Increase realism of aiming point and weapon effects (e.g., door)
Add capability to mark rooms cleared
Provide options in combat load of ammunition
Add demolition capability
Add friendly indirect fire: HE and smoke
Require that magazines be switched when ammunition expended

Discussion

This section describes implications of the results in two areas: (a) applicability of the data collection techniques and (b) status of simulation reflected in the five simulators.

Data Collection Techniques

The data collection approach combined structured task-based assessment materials, subjective assessment of subtask support by SMEs in MOUT operations, and relatively unstructured scenarios performed on developmental simulator systems. The results show that the relatively unstructured scenarios provided enough context for SMEs to provide feedback on the

effectiveness of each system. Structured task-based assessment materials are probably needed when the training structure is necessarily loose.

Although the approach provided useful information, three precautions are warranted in interpreting the results and should be considered in applying similar approaches. The major precaution is that the results are opinions from a few SMEs. Even though the NCOs who worked with DSS and SVS represented a significant proportion of available MOUT experts within USAIS, the larger sample of SMEs with a variety of backgrounds in the first data collection phase should be preferred.

Second, SMEs cannot rate how well a system supports tasks that are not part of the demonstration scenario. The SMEs in this data collection were therefore correctly reluctant to project the impact from one environment to another. As a result, the capability of TactX (outside only) to support subtasks within a building is probably under estimated.

The third precaution is that the subtask ratings represent tactics, techniques, and procedures (TTP) for the current dismounted infantryman, rather than emerging TTP for Land Warrior. This emphasis on current doctrine led the SMEs to penalize the SVS variations for features that probably ought to be considered strengths, such as, the muzzle-mounted camera and the IHAS.

Status of Simulations

Given the scope of immersion and purpose, each system could be considered successful:

- The eClass system is effective for initial instruction on basic techniques. For subtasks that require widely available capabilities; such as, shooting a door from a range of one meter, the combination of text and animation is especially efficient.

- ITS supports team coordination within a basic building, with a likely application as a refresher training vehicle for fire team leaders and squad leaders. The ITS replay capability is a promising instructional feature.

- TactX supports command and control for leaders of fire teams and squads, in particular through voice commands and hand and arm signals to control computer-generated forces.

- DSS supports individual firing techniques with the current infantryman's weapon and is especially effective in supporting precise individual movement skills within MOUT.

- The SVS variations all support individual firing and the thumb switch control for individual movement is effective within MOUT. All systems demonstrate that emerging technology associated with Land Warrior can be incorporated into a virtual environment. This capability can help with the development of TTP and can support the implementation of Land Warrior.

Because of the emphasis on identifying features that are appropriate for future immersive systems, such as CCTT, the implications of the results for TactX, DSS, and SVS are encouraging. The overall implication is that dismounted infantry can be inserted into a virtual environment with a reasonable expectation of support for individual, fire team, and squad tasks.

The effective features of the immersive systems and the recommended enhancements provide a framework for requirements to insert dismounted infantry into virtual environment simulations. These requirements are addressed in the next section.

Requirements for Dismounted Infantry Module

The intent is for the CCTT Dismounted Infantry Module to train units and leaders through the range of relevant factors concerning mission, enemy, friendly troops, terrain, and time (METT-T). These factors provide the overall structure for discussing the first set of requirements based on the assessments. The suggested characteristics are based primarily on discussions with the SMEs concerning their rationale for specific ratings and group interviews on desirable system characteristics and potential enhancements. The discussion for each factor presents the context for the requirements, followed by specific requirements. The requirements based on METT-T factors are followed by requirements for interface between the soldiers, trainers, and DIS systems.

Mission

The assessment scenarios included assaults in open terrain and in MOUT and rudimentary defense in MOUT. At a minimum, the Dismounted Infantry Module should include the combinations of assault and defense in both environments, with a provision in the assault of reorganizing for a defense. The requirement for defense implies an ability to interact with the database to set up obstacles and control indirect fire. This requirement is reflected in requirements for Troops. Though no system was configured for a support by fire mission, that capability should be available.

- The Dismounted Infantry Module should support assault and defense in MOUT and open terrain.

- The Dismounted Infantry Module should provide capability for support by fire missions.

Enemy

Enemy capabilities were a factor in the assessment of DSS and SVS. That experience showed that casualty assessment was needed to support speed in acquiring targets and deciding whether to engage and for leader decisions associated with consolidation and reorganization. At the same time, the OPFOR should not be so lethal that the mission must be terminated. Accurate support of individual and team movement requires that enemy capability should also be reflected in the realism of positions, including, for example, obstacles and booby traps.

- The Dismounted Infantry Module should assess casualties to enemy combatants.

- Workstation operators should to able to vary OPFOR capability to reflect crawl-walk-run status of team/unit being trained.

- Lethality of positions should be consistent with threat doctrine in terms of weapons, obstacles, and booby traps.

- OPFOR should have sniper fire capability.

Troops

Most of the requirements concern the capability of friendly forces. The recommendations relate to four categories: (a) direct fire weapons, (b) indirect fire weapons, (c) movement, (d) communication, and (e) civilians.

Direct Fire Weapons. The SMEs insisted that accurate weapon replicas should support infantryman firing. While characteristics such as weight, balance, and features are essential for user acceptance, accuracy also includes aiming techniques and ammunition load. The requirement for accurate aiming supports precise aiming in close quarter combat. Realism in ammunition load supports individual performance and reorganization and consolidation decisions by leaders. While the experience in the assessment was mainly with the rifle, the requirements for accuracy apply to other weapons alternatives.

The assessment also showed that the scope of available weapons should be expanded to include hand grenades and armored vehicles. Hand grenades are essential in current MOUT doctrine, required in entering the building and clearing rooms. Coordination with armored vehicles relates to support-by-fire missions and to blowing an entrance to a building in MOUT.

- Surrogate weapons should support infantryman firing, to include M16A2 and M4 rifles, SAW, shotgun, M-60 machine-gun, and JAVELIN and AT4 anti-tank weapons.

- Surrogate dismounted infantry weapons should be highly accurate in terms of weight, balance, and operational capabilities and features.

- Combatants should have access to a full range of hand grenades--fragmentation, concussion, flash-bang, HC and CS--and grenade launchers, M203 and MK19.

- Hand grenades should provide capability for cook-off effects.

- Weapons effects should be contingent on realistic aiming techniques.

- Ranges and rates of fire should reflect the capabilities of the actual weapon system.

- Ammunition basic load, including grenades, should be consistent with unit SOP or "dialable" to meet the SOP of multiple units.

- Infantry combatants require access to armored vehicle weapons, M2/M3 25mm with HEI-T and APDS-T and M1A1/M1A2.

Indirect Fire Weapons. None of the systems in the assessment supported friendly indirect fire. As a result, support was diminished for subtasks that involved movement under cover of smoke and control of illumination and high explosive fires in the defense.

- Combatant leaders should be able to call for and adjust indirect fire for smoke.

- Combatant leaders should be able to call for and adjust indirect fire during the defense to provide illumination and restrict movement of OPFOR.

Movement. This category of friendly troop capability was supported well by the immersive systems in the assessment. Depending on the training audience and purpose, the objective system should be able to support both precise movement of individual combatants, fire teams, squads and platoons and command and control of CGF. These demonstrated capabilities should be augmented by ability to support subtasks that involve descending and climbing, to include scaling walls to gain access to upper floors in MOUT.

- Leaders should have capability to command and control movement of CGF.

- System should provide accurate representation of precise movement of individual combatants.

- Individual combatants should have access to climbing/descending techniques, including ladders, ropes and grappling hooks, and rappelling.

Communication. Of the immersive systems assessed, only TactX was configured to exercise communications capabilities. That assessment confirmed the practicality of voice commands and hand and arm signals and illustrated the need for a capability to receive as well as transmit information via tactical radio. If the Dismounted Infantry Module is to support tasks that require a high level of tactical coordination among individuals, such as clearing a room, a means of non-verbal communication is required.

- The Dismounted Infantry Module should provide for control of small unit through voice commands and hand and arm signals.

- Leaders and units should have access to tactical radio communications.

- System should support non-verbal communication among combatants.

Civilians. Although civilians were not included in any of the scenarios, their inclusion is vital to support application of rules of engagement.

- The Dismounted Infantry Module should include representation of civilians.

Terrain

Because the systems were in early stages of development, the representation of terrain was only suggestive of the detail and realism that is required in the Dismounted Infantry Module. The assessment results illustrate that realism should include solid objects, increased options for movement in MOUT, and accuracy in portraying weather and visibility effects.

- Objects such as walls, vehicles, and furniture portrayed in the virtual environment should be solid. Combatants portrayed in the virtual environment should have capability of collision with each other.

- The Dismounted Infantry Module should support movement routes on roofs and in sewers in addition to ground surfaces.

- Virtual environment should represent effects of shadows on target acquisition and concealment.

- Combatants should have access to binoculars, image intensification, and thermal night vision devices.

- Night vision displays should be consistent with the field of view of the devices.

- The Dismounted Infantry Module should reflect accurate weather effects on target acquisition and use of obscurants to enable the simulation of the effects of wind on smoke.

- Combatants should have access to a compass and GPS.

Time

The immersive systems supported both realistic and automatic movement rates. Either option may be desirable depending on the purpose of the application, training or rehearsal, and the echelon addressed, to include leader, fire team, squad, or platoon. As noted in an earlier study (Pleban et al., 1998), both options should be available.

- Combatants should have access to both real-time and automatic movement.

System Interface Capabilities

In addition to illuminating system characteristics needed to represent the range of dismounted infantry performance, the assessment illustrated the need for increased interactivity with the database, flexibility, and reliability.

Database Interactivity. One of the keys to the successful integration of dismounted infantry into a virtual environment will be the provision of "dynamic terrain" (Pleban, et al., 1998) that provides combatants with a wide range of reasonable tactical alternatives. In the assessment, the need was clearest in decisions about where to enter the building and the technique of marking rooms, which is vital if the scenario is to include coordination between teams. Further, the potential training value of the defense mission depends largely on the system's capability to support shaping the battlefield through obstacles and fighting positions. Finally, the capability to replay the exercise in support of an After Action Review (AAR) is required to enhance training value.

- The objective Dismounted Infantry Module is required to allow combatants to select points of attack and avoid forcing the combatants through canned scenarios.

- In MOUT, combatants must have the capability of marking cleared rooms.

- The objective Dismounted Infantry Module should support selection of obstacle sites, construction and destruction/breaching of obstacles.

- The objective Dismounted Infantry Module should support development of individual and crew fighting positions.

Flexibility. A fortuitous result of the assessment was the demonstration of the need for simulation systems to stay current with emerging technology such as Land Warrior. Besides prolonging the useful life of the simulator, such flexibility can make the simulator a useful tool in implementing the new technology.

- The Dismounted Infantry Module must be able to adapt to newly developed weapons systems, individual equipment to include Land Warrior, navigation tools, and communications systems.

Reliability. Given the developmental nature of the immersive systems and the limited computing power available, the systems were remarkably robust. But there were enough cases that required recalibration to show the need for some minimum level of reliability in training applications. This need is pronounced for dismounted infantrymen because of the large numbers who must be trained. Similarly, procedures for initial and subsequent calibration must be simple enough for simulation center staff to calibrate leaders and infantrymen within only a few minutes.

- The Dismounted Infantry Module must experience fewer than [number TBD] malfunctions per hour of operation.

- Calibration procedures must be user friendly to enable users or simulation center personnel to complete initial calibration within 5 min and recalibration within 3 min for each leader or infantryman. [Again, actual times TBD.]

Conclusion

The results of this research effort indicate that the technology is available for development of an enhanced Dismounted Infantry Module for CCTT. Department of Defense research and development programs through SBIR and products of commercial development programs, such as the SVS and DSS, provide options to meet the requirements for the module. The assessments confirm that development of the objective module is attainable. It is recommended that the findings from this research be considered when the USAIC compiles the training device requirement for the CCTT Dismounted Infantry Module.

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Appendix A

Subtask Rating Form

Subtask Rating Form

Simulator:

SME:

Task 1: Perform Movement Techniques in MOUT

Subtask/Activity [Scope]	Technique	Rule	Decision
1A. PL directs formation and movement technique appropriate for METT-T			2 1 0 -1 -2 [control, flexibility, fire capability, security]
1B. Routes and techniques provide cover from most likely enemy positions			2 1 0 -1 -2 [weigh directness, lethality]
1C. Platoon formations and techniques provide security and enhance control			
Platoon moves in column formation	2 1 0 -1 -2	2 1 0 -1 -2 [position and dispersion]	
Platoon uses bounding overwatch technique [Overwatch positions offer observation and fire (upper floors and street level)]	2 1 0 -1 -2	2 1 0 -1 -2 [overwatch, fields of fire]	
1D. Squad formations provide security and enhance control [Column (preferred), line, and file]	2 1 0 -1 -2	2 1 0 -1 -2 [position and dispersion]	
1E. Fire team formations provide security and enhance control [Wedge (preferred), column, and file]	2 1 0 -1 -2	2 1 0 -1 -2 [position and dispersion]	
1F. Individual soldier movement maximizes cover and concealment			

Subtask/Activity [Scope]	Technique	Rule	Decision
Move inside buildings as much as possible	2 1 0 -1 -2		
Observe around corner before entering intersection or area between buildings	2 1 0 -1 -2	2 1 0 -1 -2 [Prone, head before weapon]	
Move parallel to building [Rapid, close to wall, in shadow, low profile, duck below first floor windows, step or jump over basement windows]	2 1 0 -1 -2		
Cross open areas [Move together; coordinate moves; maintain 3-5 meter interval; take advantage of cover and concealment or smoke (grenades or smoke pots); avoid masking covering fires]	2 1 0 -1 -2	2 1 0 -1 -2 [interval]	2 1 0 -1 -2 [cover and concealment; masking]
Cross obstacles [Check for booby trap (mark and by-pass); roll over; move rapidly to covered position]	2 1 0 -1 -2		
Move over roof tops [Rapid, low profile, use available cover]	2 1 0 -1 -2		

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Subtask/Activity [Scope]	Technique	Rule	Decision
1G. Platoon reacts to sniper fire			
PL decides whether to suppress and bypass the sniper or to fix and engage the sniper			2 1 0 -1 -2 [ROE, threat, offense priorities]
Platoon projects smoke or riot control agents near the sniper's position	2 1 0 -1 -2		
Platoon maneuvers against sniper and returns fire en masse [Coordinate with suppressive mortar fire]	2 1 0 -1 -2	2 1 0 -1 -2 [call for fire]	
Fire team maneuvers to engage sniper from close range [Coordinate with suppressive mortar fire]	2 1 0 -1 -2	2 1 0 -1 -2 [call for fire]	
Friendly snipers (including option of SOF teams) engage enemy sniper with precision fire	2 1 0 -1 -2		
Overmatching weapons (e.g., machine gun, antitank weapons) fire on sniper position	2 1 0 -1 -2		
1H. Soldiers take hasty firing positions			
Fire at corner of building [Fire from shoulder that exposes less of soldier's body; kneeling or prone position]	2 1 0 -1 -2	2 1 0 -1 -2 [minimize exposure]	
Fire from behind wall [Fire around (rather than over) wall]	2 1 0 -1 -2	2 1 0 -1 -2 [minimize exposure]	
Fire from window or loophole [Back in room (conceal muzzle flash); kneeling position]	2 1 0 -1 -2	2 1 0 -1 -2 [minimize exposure]	
Fire from roof [Back slope, behind chimney or other protrusion]	2 1 0 -1 -2	2 1 0 -1 -2 [minimize exposure]	

Task 2: Assault Element Assaults the Objective Building

Subtask/Activity [Scope]	Technique	Rule	Decision
2A. SL designates entry point [Highest point that squad can enter quickly and under cover]		2 1 0 -1 -2 [avoid doors, windows]	2 1 0 -1 -2 [height, cover, speed]
2B. SL designates route to entry point		2 1 0 -1 -2 [approach from enemy flank or rear]	2 1 0 -1 -2 [directness, cover and concealment]
2C. Assault element or supporting weapons blow entrance through wall	2 1 0 -1 -2		
2D. (If entry point requires) Assault element enters upper story of building			
Gain access to entry point using ladders	2 1 0 -1 -2		
Gain access to entry point using ropes and grappling hooks	2 1 0 -1 -2		
Gain access to entry point by rappelling from the roof	2 1 0 -1 -2		

Subtask/Activity [Scope]	Technique	Rule	Decision
2E. Assault element enters building			
Soldier throws grenade through entrance [Allows 2-second cook-off; announces alert, takes cover]	2 1 0 -1 -2	2 1 0 -1 -2 [cook-off]	
When soldier announces alert, other soldiers take cover	2 1 0 -1 -2		
First soldier enters the building [Positions against wall; engages identified or likely enemy positions with rapid, short bursts; commands next soldier to enter and specifies location]	2 1 0 -1 -2		2 1 0 -1 -2 [engage or not; subsequent location]
Subsequent soldiers enter building [Announce intent to enter, enter, position against the wall, scan the room, and call for next man]	2 1 0 -1 -2		2 1 0 -1 -2 [subsequent location]
(Alternative) Two soldiers enter building simultaneously [Soldier from right moves to right, firing from left to right; soldier from left moves to left, firing from right to left. Both keep backs to the wall and fire from different levels. Senior soldier calls for next man]	2 1 0 -1 -2		2 1 0 -1 -2 [subsequent location]
2F. SL marks the entry point	2 1 0 -1 -2		
2G. Team covers staircases and other routes leading to upper and lower stories		2 1 0 -1 -2 [security priority]	

Task 3: Support Element Provides Fire Support for the Assault Force Entry of Building

Subtask/Activity [Scope]	Technique	Rule	Decision
3A. SL assigns each soldier and key weapon a target or area to cover			2 1 0 -1 -2 [ID enemy locations based on building analysis]
3B. Support element maintains continuous communications with and observation of the assault element.	2 1 0 -1 -2		
3C. Support element suppresses/kills enemy within the objective building and adjacent buildings [Destroys or suppresses enemy crew-served weapons first]	2 1 0 -1 -2	2 1 0 -1 -2 [target priority]	
3D. SL repositions soldiers and weapons, if necessary, to prevent withdrawal, reinforcement, or counter attack			2 1 0 -1 -2 [ID when conditions require move]
3E. During the assault, the support element maintains suppressive fire [Stagger reloading and firing (fire at different rates); coordinate individual and crew-served weapons]	2 1 0 -1 -2		2 1 0 -1 -2 [ID when to adjust rate of fire]
3F. During the assault, the support element obscures the enemy position with smoke	2 1 0 -1 -2		
3G. Just before the assault element enters the objective building, the support element increases the rate of fire until masked by the assault element	2 1 0 -1 -2		2 1 0 -1 -2 [ID when to increase and determine if masked]
3H. When the assault element enters the building, the support element shifts fires to adjacent buildings and the level of the objective building not being entered (e.g., enter high, suppress low)	2 1 0 -1 -2		2 1 0 -1 -2 [ID when to shift]

Task 4: Assault Element Clears the Objective Building

Subtask/Activity [Scope]	Technique	Rule	Decision
4A. Assault element clears stairs			
Checks for and marks trip wires and booby traps	2 1 0 -1 -2		
Soldier announces alert and throws cooked off grenade to the top of the stairs; repeats with a cooked off grenade into the hallway [Soldier and element take cover]	2 1 0 -1 -2	2 1 0 -1 -2 [Cook-off time]	
(If entry point was not at the top story) Assault element moves to the top story of the building	2 1 0 -1 -2		
4B. Team clears hallways			
Move in formation that is appropriate for hallway and provides all-around security (including upward in area of stairs) [Serpentine for narrow hallway, rolling T for wide hallway]	2 1 0 -1 -2	2 1 0 -1 -2 [formation types; sectors]	
Clear intersections [Coordinate move into intersection; cover sectors; maintain security]	2 1 0 -1 -2	2 1 0 -1 -2 [sectors]	
4C. SL directs the assault element first to clear the rooms that overlook approaches to the building		2 1 0 -1 -2 [priority]	
4D. SL coordinates with other squads to be sure that friendly forces are not in adjacent rooms	2 1 0 -1 -2		
4E. Soldiers line up as close to the entry point as possible [Crouched position; weapon at ready position, pointed in a safe direction]	2 1 0 -1 -2	2 1 0 -1 -2 [order and safety]	
4F. Soldier breaches wall using demolitions (rather than door) [Silhouette charge using detonation cord taped to stiff cardboard (e.g., E-type targets)]	2 1 0 -1 -2	2 1 0 -1 -2 [amount cord for wall type]	
4G. Soldier breaches door with demolitions (alternatives)			

Subtask/Activity [Scope]	Technique	Rule	Decision
Breach door using preassembled general purpose charge (detonation cord secured to C4 block, leaving loop of cord) [Loop over doorknob; prime cord; detonate after non-verbal signal that team is prepared]	2 1 0 -1 -2		
Breach door using preassembled flexible linear charge (detonation cord attached to double-sided contact tape) [Tape charge near hinges (cover at least half the height); prime bottom of charge; detonate after non-verbal signal that team is prepared]	2 1 0 -1 -2	2 1 0 -1 -2 [location; amount cord for door type]	
4H. Soldier breaches door with weapon (alternative) [Non-verbal signal that team is prepared; shotgunner, rifleman, or SAW gunner fires blasts or burst between doorknob and frame; kicks in the door]	2 1 0 -1 -2	2 1 0 -1 -2 [aiming point; number of rounds]	
4I. Four-member fire team enters the room			
Soldier announces alert and throws cooked off grenade into the room [Soldier and team members take cover]	2 1 0 -1 -2	2 1 0 -1 -2 [cook-off; warning]	
After the grenade detonates, soldier 1 enters the room and moves in straight line toward corner for which he is responsible [Moves quickly past the doorway; clears corner; orients on sector]	2 1 0 -1 -2	2 1 0 -1 -2 [points of domination for center & corner door]	
Soldier 2 moves toward the corner opposite soldier 1 [Moves quickly past the doorway; clears corner; orients on sector with overlapping fields of fire]	2 1 0 -1 -2	2 1 0 -1 -2 [points of domination]	
Soldier 3 buttonhooks between soldier 1 and the door [Moves quickly past the doorway; orients on sector with overlapping fields of fire]	2 1 0 -1 -2	2 1 0 -1 -2 [points of domination]	

Subtask/Activity [Scope]	Technique	Rule	Decision
Soldier 4 buttonhooks between soldier 2 and the door or covers the team's back and blocks the door [Moves quickly past the door and orients on sector; or takes position at door and orients on hall]	2 1 0 -1 -2	2 1 0 -1 -2 [points of domination]	2 1 0 -1 -2 [role of soldier 4]
Soldiers take secure routes within the room [Avoid skylining through windows or doors; avoid and mark trip wires and booby traps]	2 1 0 -1 -2		
4J. Soldiers apply close-combat techniques			
Engage targets on the move to designated points [Without stopping or turning around]	2 1 0 -1 -2		
Engage most immediate enemy threats first	2 1 0 -1 -2		2 1 0 -1 -2 [target priority]
Engage with short bursts [Double tap preferred]	2 1 0 -1 -2		
Employ appropriate aiming technique [Aimed quick kill preferred out to 12 meters]	2 1 0 -1 -2	2 1 0 -1 -2 [technique for range]	
Aim to incapacitate enemy soldiers immediately [Head shots preferred]	2 1 0 -1 -2	2 1 0 -1 -2 [Shot placement]	
Comply with rules of engagement [Avoid noncombatant casualties and fratricide]			2 1 0 -1 -2 [target discrimination]
4K. Soldiers apply close combat techniques under limited visibility conditions			
Acquire and engage targets using thermal imaging devices	2 1 0 -1 -2		
Engage targets using infrared aiming device	2 1 0 -1 -2		
4L. Mark cleared room [Team leader announces ROOM CLEAR; room marked IAW unit SOP; account for limited visibility]	2 1 0 -1 -2		

Subtask/Activity [Scope]	Technique	Rule	Decision
4M. SL rotates fire teams as necessary [Keep fresh; continue momentum; coordinate to avoid fratricide]	2 1 0 -1 -2		2 1 0 -1 -2 [when to rotate; sequence of rooms]
4N. After all rooms have been cleared, squad consolidates and reorganizes			
SL positions soldiers to cover enemy routes of counterattack and infiltration	2 1 0 -1 -2	2 1 0 -1 -2 [points to cover]	
SL redistributes ammunition	2 1 0 -1 -2		
SL prepares ammunition, casualty, and equipment (ACE) report	2 1 0 -1 -2		
Assault element treats and evacuates casualties	2 1 0 -1 -2		
SL marks building and entry points IAW unit SOP	2 1 0 -1 -2		

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Task 5: Defend Building during MOUT (Daylight)

Subtask/Activity [Scope]	Technique	Rule	Decision
5A. PL designates area for observation post (OP); squad leader selects specific position [Field of observation overlays adjacent OPs; covered & concealed route; not obvious position (e.g., tower); communication with PL]			2 1 0 -1 -2 [trade off observation, overlap, routes]
5B. Platoon installs tactical obstacles (e.g., protective wire) [Irregular pattern, employed in depth, booby trapped]	2 1 0 -1 -2		2 1 0 -1 -2 [locations to delay, canalize]
5C. PL develops fire support plan [Indirect fire to cover avenues of approach, obstacles, withdrawal]	2 1 0 -1 -2		
5D. PL assigns sectors of fire, engagement priorities, and fire control measures [Cover enemy avenues of approach (including subterranean, such as sewer, and roof tops), likely enemy positions, tactical and natural obstacles; provide FPF (from company commander)]	2 1 0 -1 -2		2 1 0 -1 -2 [priorities vs. assets; engagement area & decisive point]
5E. Soldiers select fighting positions			
Riflemen select positions at windows or loopholes	2 1 0 -1 -2		
Gunners and crews for recoilless weapons and ATGM select positions that allow for arming distance and backblast [Avoid inside of building; if inside required, space and ventilation for backblast; TOW and Dragon 65-meter arming distance; prefer roof top]	2 1 0 -1 -2	2 1 0 -1 -2 [backblast limits & arming distance]	
Machine gunners select positions that cover dismounted avenues of approach [Avoid door or window; lower stories to provide grazing fire; prefer loophole at corner of building or position under building; if grazing fire blocked (e.g., by rubble), prefer upper floors]	2 1 0 -1 -2	2 1 0 -1 -2 [location factors]	

Subtask/Activity [Scope]	Technique	Rule	Decision
Snipers select positions that maximize fields of fire [On or near top of the building; cover obstacles, roofs, and gaps in FPF]	2 1 0 -1 -2	2 1 0 -1 -2 [maximize field of fire]	
5F. Gunners prepare range cards [TRPs; emplace aiming and sector stakes]	2 1 0-1-2	2 1 0-1-2 [format]	
5G. Squad leaders prepare squad sector sketches [Primary and supplementary sectors of fire, TRPs, obstacles]	2 1 0-1-2	2 1 0-1-2 [format]	
5H. PL prepares platoon sector sketch [Consolidate squad sketches; add indirect fire, FPF, OP, CP]	2 1 0-1-2	2 1 0-1-2 [format]	
5I. Soldiers prepare defensive positions			
Riflemen barricade windows and fortify loopholes [Irregular openings; glass removed]	2 1 0-1-2	2 1 0-1-2 [minimize detection]	
Riflemen and snipers prepare alternate and deceptive firing positions	2 1 0-1-2		
Soldiers reinforce positions [Layers of sandbags in front and to the sides; if upper level, 2 layers on floor; (except for antitank weapons) blast wall; overhead cover if outside]	2 1 0-1-2	2 1 0-1-2 [all round protection]	
5J. Platoon engages enemy			
PL calls in OPs (if appropriate) [Keeps OPs in place if position protected, can provide effective fire, or movement would disclose defensive positions]	2 1 0-1-2		2 1 0-1-2 [weigh benefits]
PL calls for and adjusts indirect fire when enemy is acquired	2 1 0-1-2	2 1 0-1-2 [adjustment procedures]	
Direct fire weapons engage enemy as forces enter sector	2 1 0-1-2		

Subtask/Activity [Scope]	Technique	Rule	Decision
Riflemen and snipers move to alternate positions; Dragons to supplementary positions	2 1 0 -1 -2	2 1 0 -1 -2 [indicators to move]	
PL initiates FPF as enemy closes in on obstacles	2 1 0 -1 -2	2 1 0 -1 -2 [indicators; fire commands]	
5K. Platoon continues to defend or PL requests permission to withdraw			2 1 0 -1 -2 [threat vs. assets]
5L. Platoon consolidates and reorganizes			
PL repositions OP forward	2 1 0 -1 -2		
Squad leaders provide ACE reports	2 1 0 -1 -2		
PL provides a platoon ACE report	2 1 0 -1 -2		
Platoon evacuates casualties [Separate KIAs, litter urgent, litter priority]	2 1 0 -1 -2	2 1 0 -1 -2 [ID serious casualties]	
Platoon reoccupies, repairs, and improves positions	2 1 0 -1 -2		

Task 6: Defend a Building during MOUT at Night (Modification to Daylight)

Subtask/Activity [Scope]	Technique	Rule	Decision
6A. PL positions listening posts (LPs) and directs patrols into open areas covered by observation during daylight [Communication with PL]	2 1 0 -1 -2		2 1 0 -1 -2 [ID likely enemy approach routes]
6B. Weapons move to alternate positions	2 1 0 -1 -2		
6C. Gunners mark TRPs for limited visibility (e.g., glint tape, thermal tape, budd lights, chemlites)	2 1 0 -1 -2		
6D. Platoon emplaces early warning devices	2 1 0 -1 -2		
6E. Platoon engages enemy under limited visibility conditions			
PL calls for and adjusts indirect fire for illumination when enemy is acquired	2 1 0 -1 -2	2 1 0 -1 -2 [adjustment procedures]	
Riflemen and gunners acquire and engage targets using night vision devices	2 1 0 -1 -2		

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Appendix B

Feature Rating Forms

Importance of Features (Phase 1)

SME:

Over the last two days, you have gained experience with a variety of simulator features. We would like to get your opinion of the importance of some of these features (as well as some other possible features) for future simulators.

Feature	Importance		
	High	Moderate	Low
Global Positioning System (TactX)			
ACE Report (TactX)			
Binoculars (TactX)			
Compass (TactX)			
Virtual Radio (TactX)			
Pyrotechnics (TactX)			
Low Visibility Conditions (TactX)			
Visual Menu of Speech Commands (TactX)			
Demolitions (Other)			
NBC Conditions (Other)			
Choice of View (ITS)			
Remediation (ITS)			
Replay (ITS)			
Animation (eClass)			

What impact do the response modes in TactX and ITS have on training dismounted infantry tasks?

Response Method	Impact		
	Add	Neutral	Detract
TactX Movement			
Finger Position			
Laser Point			
TactX M16 Firing			
TactX Speech Commands			
TactX Hand and Arm Signals			
ITS Mouse Commands			
ITS Keyboard Commands			

Importance of Features (Phase 2)

SME:

Over the last two days, your have gained experience with several features applied to MOUT. We would now like your opinion on the benefits of extending these features to other systems covering the gamut of dismounted infantry operations. Please indicate how important you think each feature is, then how the ways of interfacing with the systems are likely to affect training.

Feature	Importance		
	High	Moderate	Low
Realistic rifle (SVS, DSS)			
Articulated movement within motion capture area (DSS)			
Choice of alternative weapons (DSS)			
Passive amplification for low visibility (SVS, DSS)			
Realistic movement rate (SVS-treadmill)			
Body movement on treadmill (SVS-treadmill)			
Firing positions (SVS-base, SVS-panorama, DSS)			
Other: Hand grenades			

Impact of Interface Modes

Mode	Impact		
	Add	Neutral	Detract
Aiming techniques			
Sight post (DSS)			
Reticle (SVS)			
Speed control switch (DSS, SVS)			
Speed control switch location			
Hand guard (DSS)			
Receiver (SVS)			
Flat-screen projection (SVS-base)			
Panoramic-screen projection (SVS-panoramic)			
Head-mount display (DSS)			
Head-mount display (SVS-treadmill)			

Appendix C

Subtask Ratings for All Systems

Simulator: TactX

Task 1: Perform Movement Techniques in MOUT

Subtask	Tech.	Rule	Decision
1A. PL directs formation and movement technique appropriate for METT-T			1.33
1B. Routes and techniques provide cover from most likely enemy positions			1.17
1C. Platoon formations and techniques provide security and enhance control	1.00	1.00	
1D. Squad formations provide security and enhance control	1.50	1.17	
1E. Fire team formations provide security and enhance control	1.70	1.17	
1F. Individual soldier movement maximizes cover and concealment	0.64	0.42	0.67
1G. Platoon reacts to sniper fire	0.50	0.50	0.70
1H. Soldiers take hasty firing positions	0.54	0.75	

Task 2: Assault Element Assaults the Objective Building

Subtask	Tech.	Rule	Decision
2A. SL designates entry point		0.83	0.83
2B. SL designates route to entry point		1.17	1.00
2C. Assault element or supporting weapons blow entrance through wall	0.50		
2D. (If entry point requires) Assault element enters upper story of building	0.50		
2E. Assault element enters building	0.60	0.50	0.67
2F. SL marks the entry point	0.50		
2G. Team covers staircases and other routes leading to upper and lower stories		0.67	

Task 3: Support Element Provides Fire Support for the Assault Force Entry of Building

Subtask	Tech.	Rule	Decision
3A. SL assigns each soldier and key weapon a target or area to cover			0.67
3B. Support element maintains continuous communications with and observation of the assault element.	1.00		
3C. Support element suppresses/kills enemy within the objective building and adjacent buildings	1.00	1.00	
3D. SL repositions soldiers and weapons, if necessary, to prevent withdrawal, reinforcement, or counter attack			0.83
3E. During the assault, the support element maintains suppressive fire	0.33		0.33
3F. During the assault, the support element obscures the enemy position with smoke	0.33		
3G. Just before the assault element enters the objective building, the support element increases the rate of fire until masked by the assault element	0.17		0.17
3H. When the assault element enters the building, the support element shifts fires to adjacent buildings and the level of the objective building not being entered (e.g., enter high, suppress low)	0.83		1.00

Task 4: Assault Element Clears the Objective Building

Subtask	Tech.	Rule	Decision
4A. Assault element clears stairs	0.50	0.50	
4B. Team clears hallways	0.67	0.67	
4C. SL directs the assault element first to clear the rooms that overlook approaches to the building		0.67	
4D. SL coordinates with other squads to be sure that friendly forces are not in adjacent rooms	0.67		
4E. Soldiers line up as close to the entry point as possible	0.50	0.67	
4F. Soldier breaches wall using demolitions (rather than door)	0.50	0.50	
4G. Soldier breaches door with demolitions (alternatives)	0.50	0.67	
4H. Soldier breaches door with weapon (alternative)	0.50	0.50	
4I. Four-member fire team enters the room	0.64	0.63	0.33
4J. Soldiers apply close-combat techniques	0.60	0.50	0.67
4K. Soldiers apply close combat techniques under limited visibility conditions	0.42		

Subtask	Tech.	Rule	Decision
4L. Mark cleared room	0.50		
4M. SL rotates fire teams as necessary	0.33		0.33
4N. After all rooms have been cleared, squad consolidates and reorganizes	0.53	0.83	

Task 5: Defend Building during MOUT (Daylight)

Subtask	Tech.	Rule	Decision
5A. PL designates area for observation post (OP); squad leader selects specific position			0.67
5B. Platoon installs tactical obstacles (e.g., protective wire)	0.00		0.17
5C. PL develops fire support plan	0.17		
5D. PL assigns sectors of fire, engagement priorities, and fire control measures	0.50		0.50
5E. Soldiers select fighting positions	0.21	0.22	
5F. Gunners prepare range cards	0.50	0.67	
5G. Squad leaders prepare squad sector sketches	0.50	0.67	
5H. PL prepares platoon sector sketch	0.60	0.67	
5I. Soldiers prepare defensive positions	0.06	0.08	
5J. Platoon engages enemy	0.37	0.38	0.50
5K. Platoon continues to defend or PL requests permission to withdraw			0.33
5L. Platoon consolidates and reorganizes	0.47	0.50	

Task 6: Defend a Building during MOUT at Night (Modification to Daylight)

Subtask	Tech.	Rule	Decision
6A. PL positions listening posts (LPs) and directs patrols into open areas covered by observation during daylight	0.33		0.50
6B. Weapons move to alternate positions	0.33		
6C. Gunners mark TRPs for limited visibility (e.g., glint tape, thermal tape, budd lights, chemlites)	0.17		
6D. Platoon emplaces early warning devices	0.17		
6E. Platoon engages enemy under limited visibility conditions	0.58	0.50	

Simulator: ITS

Task 1: Perform Movement Techniques in MOUT

Subtask	Tech.	Rule	Decision
1A. PL directs formation and movement technique appropriate for METT-T			0.50
1B. Routes and techniques provide cover from most likely enemy positions			0.67
1C. Platoon formations and techniques provide security and enhance control	0.58	0.50	
1D. Squad formations provide security and enhance control	0.67	0.67	
1E. Fire team formations provide security and enhance control	0.83	0.83	
1F. Individual soldier movement maximizes cover and concealment	0.56	0.33	0.33
1G. Platoon reacts to sniper fire	0.33	0.17	0.17
1H. Soldiers take hasty firing positions	0.33	0.33	

Task 2: Assault Element Assaults the Objective Building

Subtask	Tech.	Rule	Decision
2A. SL designates entry point		0.33	0.33
2B. SL designates route to entry point		0.33	0.33
2C. Assault element or supporting weapons blow entrance through wall	0.33		
2D. (If entry point requires) Assault element enters upper story of building	0.33		
2E. Assault element enters building	0.37	0.33	0.47
2F. SL marks the entry point	0.50		
2G. Team covers staircases and other routes leading to upper and lower stories		0.50	

Task 3: Support Element Provides Fire Support for the Assault Force Entry of Building

Subtask	Tech.	Rule	Decision
3A. SL assigns each soldier and key weapon a target or area to cover			0.33
3B. Support element maintains continuous communications with and observation of the assault element.	0.33		
3C. Support element suppresses/kills enemy within the objective building and adjacent buildings	0.33	0.33	
3D. SL repositions soldiers and weapons, if necessary, to prevent withdrawal, reinforcement, or counter attack			0.67
3E. During the assault, the support element maintains suppressive fire	0.33		0.17
3F. During the assault, the support element obscures the enemy position with smoke	0.33		
3G. Just before the assault element enters the objective building, the support element increases the rate of fire until masked by the assault element	0.33		0.33
3H. When the assault element enters the building, the support element shifts fires to adjacent buildings and the level of the objective building not being entered (e.g., enter high, suppress low)	0.33		0.33

Task 4: Assault Element Clears the Objective Building

Subtask	Tech.	Rule	Decision
4A. Assault element clears stairs	0.33	0.33	
4B. Team clears hallways	1.08	1.08	
4C. SL directs the assault element first to clear the rooms that overlook approaches to the building		0.67	
4D. SL coordinates with other squads to be sure that friendly forces are not in adjacent rooms	-0.17		
4E. Soldiers line up as close to the entry point as possible	1.00	1.00	
4F. Soldier breaches wall using demolitions (rather than door)	0.33	0.17	
4G. Soldier breaches door with demolitions (alternatives)	0.33	0.33	
4H. Soldier breaches door with weapon (alternative)	1.33	1.17	
4I. Four-member fire team enters the room	0.81	0.87	0.67
4J. Soldiers apply close-combat techniques	0.50	0.33	0.67
4K. Soldiers apply close combat techniques under limited visibility conditions	0.33		

Subtask	Tech.	Rule	Decision
4L. Mark cleared room	1.33		
4M. SL rotates fire teams as necessary	0.83		0.67
4N. After all rooms have been cleared, squad consolidates and reorganizes	0.47	0.67	

Task 5: Defend Building during MOUT (Daylight)

Subtask	Tech.	Rule	Decision
5A. PL designates area for observation post (OP); squad leader selects specific position			0.33
5B. Platoon installs tactical obstacles (e.g., protective wire)	0.17		0.33
5C. PL develops fire support plan	0.33		
5D. PL assigns sectors of fire, engagement priorities, and fire control measures	0.33		0.33
5E. Soldiers select fighting positions	0.33	0.33	
5F. Gunners prepare range cards	0.33	0.33	
5G. Squad leaders prepare squad sector sketches	0.33	0.33	
5H. PL prepares platoon sector sketch	0.33	0.33	
5I. Soldiers prepare defensive positions	0.33	0.33	
5J. Platoon engages enemy	0.37	0.33	0.33
5K. Platoon continues to defend or PL requests permission to withdraw			0.33
5L. Platoon consolidates and reorganizes	0.33	0.00	

Task 6: Defend a Building during MOUT at Night (Modification to Daylight)

Subtask	Tech.	Rule	Decision
6A. PL positions listening posts (LPs) and directs patrols into open areas covered by observation during daylight	0.33		0.33
6B. Weapons move to alternate positions	0.33		
6C. Gunners mark TRPs for limited visibility (e.g., glint tape, thermal tape, budd lights, chemlites)	0.33		
6D. Platoon emplaces early warning devices	0.33		
6E. Platoon engages enemy under limited visibility conditions	0.33	0.33	

Simulator: eClass

Task 4: Assault Element Clears the Objective Building

Subtask	Tech.	Rule	Decision
4A. Assault element clears stairs	0.22	0.17	
4B. Team clears hallways	1.25	1.25	
4C. SL directs the assault element first to clear the rooms that overlook approaches to the building		0.33	
4D. SL coordinates with other squads to be sure that friendly forces are not in adjacent rooms	0.33		
4E. Soldiers line up as close to the entry point as possible	1.17	1.17	
4F. Soldier breaches wall using demolitions (rather than door)	0.50	0.50	
4G. Soldier breaches door with demolitions (alternatives)	0.83	0.33	
4H. Soldier breaches door with weapon (alternative)	1.5	1.33	
4I. Four-member fire team enters the room	1.06	1.20	1.00
4J. Soldiers apply close-combat techniques	0.87	0.58	0.83
4K. Soldiers apply close combat techniques under limited visibility conditions	0.33		
4L. Mark cleared room	0.50		
4M. SL rotates fire teams as necessary	0.17		0.00
4N. After all rooms have been cleared, squad consolidates and reorganizes	0.27	0.33	

Simulator: DSS

Task 1: Perform Movement Techniques in MOUT

Subtask	Tech.	Rule	Decision
1A. PL directs formation and movement technique appropriate for METT-T			0.00
1B. Routes and techniques provide cover from most likely enemy positions			0.33
1C. Platoon formations and techniques provide security and enhance control	0.00	0.00	
1D. Squad formations provide security and enhance control	0.00	0.00	
1E. Fire team formations provide security and enhance control	0.00	0.00	
1F. Individual soldier movement maximizes cover and concealment	1.00	1.16	0.33
1G. Platoon reacts to sniper fire	0.13	0.00	0.00
1H. Soldiers take hasty firing positions	1.08	0.83	

Task 2: Assault Element Assaults the Objective Building

Subtask	Tech.	Rule	Decision
2A. SL designates entry point		1.00	0.67
2B. SL designates route to entry point		1.33	1.33
2C. Assault element or supporting weapons blow entrance through wall	1.33		
2D. (If entry point requires) Assault element enters upper story of building	0.00		
2E. Assault element enters building	0.80	0.00	1.13
2F. SL marks the entry point	-0.67		
2G. Team covers staircases and other routes leading to upper and lower stories		0.67	

Task 3: Support Element Provides Fire Support for the Assault Force Entry of Building

Subtask	Tech.	Rule	Decision
3A. SL assigns each soldier and key weapon a target or area to cover			0.67
3B. Support element maintains continuous communications with and observation of the assault element.	0.00		
3C. Support element suppresses/kills enemy within the objective building and adjacent buildings	0.33	0.33	
3D. SL repositions soldiers and weapons, if necessary, to prevent withdrawal, reinforcement, or counter attack			.67
3E. During the assault, the support element maintains suppressive fire	.67		.67
3F. During the assault, the support element obscures the enemy position with smoke	0.00		
3G. Just before the assault element enters the objective building, the support element increases the rate of fire until masked by the assault element	0.33		0.33
3H. When the assault element enters the building, the support element shifts fires to adjacent buildings and the level of the objective building not being entered (e.g., enter high, suppress low)	.67		.67

Task 4: Assault Element Clears the Objective Building

Subtask	Tech.	Rule	Decision
4A. Assault element clears stairs	0.55	0.00	
4B. Team clears hallways	0.33	0.33	
4C. SL directs the assault element first to clear the rooms that overlook approaches to the building		1.00	
4D. SL coordinates with other squads to be sure that friendly forces are not in adjacent rooms	0.00		
4E. Soldiers line up as close to the entry point as possible	1.67	1.67	
4F. Soldier breaches wall using demolitions (rather than door)	0.00	0.00	
4G. Soldier breaches door with demolitions (alternatives)	0.00	0.00	
4H. Soldier breaches door with weapon (alternative)	1.67	1.00	
4I. Four-member fire team enters the room	0.89	1.00	1.00
4J. Soldiers apply close-combat techniques	1.33	1.17	1.67
4K. Soldiers apply close combat techniques under limited visibility conditions	0.17		

Subtask	Tech.	Rule	Decision
4L. Mark cleared room	-0.67		
4M. SL rotates fire teams as necessary	0.33		0.33
4N. After all rooms have been cleared, squad consolidates and reorganizes	0.13	0.33	

Task 5: Defend Building during MOUT (Daylight)

Subtask	Tech.	Rule	Decision
5A. PL designates area for observation post (OP); squad leader selects specific position			0.33
5B. Platoon installs tactical obstacles (e.g., protective wire)	0.00		0.00
5C. PL develops fire support plan	0.00		
5D. PL assigns sectors of fire, engagement priorities, and fire control measures	0.33		0.33
5E. Soldiers select fighting positions	1.00	0.78	
5F. Gunners prepare range cards	0.00	0.00	
5G. Squad leaders prepare squad sector sketches	0.00	0.00	
5H. PL prepares platoon sector sketch	0.00	0.00	
5I. Soldiers prepare defensive positions	0.11	0.17	
5J. Platoon engages enemy	0.13	0.17	0.00
5K. Platoon continues to defend or PL requests permission to withdraw			0.67
5L. Platoon consolidates and reorganizes	0.06	0.00	

Task 6: Defend a Building during MOUT at Night (Modification to Daylight)

Subtask	Tech.	Rule	Decision
6A. PL positions listening posts (LPs) and directs patrols into open areas covered by observation during daylight	0.00		0.00
6B. Weapons move to alternate positions	0.67		
6C. Gunners mark TRPs for limited visibility (e.g., glint tape, thermal tape, budd lights, chemlites)	0.00		
6D. Platoon emplaces early warning devices	0.00		
6E. Platoon engages enemy under limited visibility conditions	0.67	0.00	

Simulator: SVS (Base)

Task 1: Perform Movement Techniques in MOUT

Subtask	Tech.	Rule	Decision
1A. PL directs formation and movement technique appropriate for METT-T			0.00
1B. Routes and techniques provide cover from most likely enemy positions			0.33
1C. Platoon formations and techniques provide security and enhance control	0.33	0.33	
1D. Squad formations provide security and enhance control	0.33	0.33	
1E. Fire team formations provide security and enhance control	0.33	0.33	
1F. Individual soldier movement maximizes cover and concealment	0.67	0.33	0.00
1G. Platoon reacts to sniper fire	0.07	0.00	0.00
1H. Soldiers take hasty firing positions	1.00	1.00	

Task 2: Assault Element Assaults the Objective Building

Subtask	Tech.	Rule	Decision
2A. SL designates entry point		1.00	1.00
2B. SL designates route to entry point		1.33	1.33
2C. Assault element or supporting weapons blow entrance through wall	0.33		
2D. (If entry point requires) Assault element enters upper story of building	0.00		
2E. Assault element enters building	0.53	0.17	0.89
2F. SL marks the entry point	-0.33		
2G. Team covers staircases and other routes leading to upper and lower stories		0.33	

Task 3: Support Element Provides Fire Support for the Assault Force Entry of Building

Subtask	Tech.	Rule	Decision
3A. SL assigns each soldier and key weapon a target or area to cover			0.67
3B. Support element maintains continuous communications with and observation of the assault element.	0.00		
3C. Support element suppresses/kills enemy within the objective building and adjacent buildings	0.33	0.33	
3D. SL repositions soldiers and weapons, if necessary, to prevent withdrawal, reinforcement, or counter attack			0.00
3E. During the assault, the support element maintains suppressive fire	0.00		0.00
3F. During the assault, the support element obscures the enemy position with smoke	0.00		
3G. Just before the assault element enters the objective building, the support element increases the rate of fire until masked by the assault element	0.33		0.33
3H. When the assault element enters the building, the support element shifts fires to adjacent buildings and the level of the objective building not being entered (e.g., enter high, suppress low)	0.33		0.33

Task 4: Assault Element Clears the Objective Building

Subtask	Tech.	Rule	Decision
4A. Assault element clears stairs	0.11	0.00	
4B. Team clears hallways	0.13	0.13	
4C. SL directs the assault element first to clear the rooms that overlook approaches to the building		1.00	
4D. SL coordinates with other squads to be sure that friendly forces are not in adjacent rooms	0.33		
4E. Soldiers line up as close to the entry point as possible	1.00	1.00	
4F. Soldier breaches wall using demolitions (rather than door)	0.00	0.00	
4G. Soldier breaches door with demolitions (alternatives)	0.00	0.00	
4H. Soldier breaches door with weapon (alternative)	1.33	0.67	
4I. Four-member fire team enters the room	0.28	0.27	0.33
4J. Soldiers apply close-combat techniques	0.93	0.83	1.17
4K. Soldiers apply close combat techniques under limited visibility conditions	0.17		

Subtask	Tech.	Rule	Decision
4L. Mark cleared room	-0.67		
4M. SL rotates fire teams as necessary	0.33		0.33
4N. After all rooms have been cleared, squad consolidates and reorganizes	0.13	0.33	

Task 5: Defend Building during MOUT (Daylight)

Subtask	Tech.	Rule	Decision
5A. PL designates area for observation post (OP); squad leader selects specific position			0.33
5B. Platoon installs tactical obstacles (e.g., protective wire)	0.00		0.00
5C. PL develops fire support plan	0.00		
5D. PL assigns sectors of fire, engagement priorities, and fire control measures	0.67		0.67
5E. Soldiers select fighting positions	0.50	0.22	
5F. Gunners prepare range cards	0.00	0.00	
5G. Squad leaders prepare squad sector sketches	0.00	0.00	
5H. PL prepares platoon sector sketch	0.00	0.00	
5I. Soldiers prepare defensive positions	0.11	0.17	
5J. Platoon engages enemy	0.40	0.33	0.00
5K. Platoon continues to defend or PL requests permission to withdraw			0.00
5L. Platoon consolidates and reorganizes	0.07	0.00	

Task 6: Defend a Building during MOUT at Night (Modification to Daylight)

Subtask	Tech.	Rule	Decision
6A. PL positions listening posts (LPs) and directs patrols into open areas covered by observation during daylight	0.00		0.00
6B. Weapons move to alternate positions	0.67		
6C. Gunners mark TRPs for limited visibility (e.g., glint tape, thermal tape, budd lights, chemlites)	0.00		
6D. Platoon emplaces early warning devices	0.00		
6E. Platoon engages enemy under limited visibility conditions	0.33	0.00	

Simulator: SVS (Panoramic)

Task 1: Perform Movement Techniques in MOUT

Subtask	Tech.	Rule	Decision
1A. PL directs formation and movement technique appropriate for METT-T			0.00
1B. Routes and techniques provide cover from most likely enemy positions			0.00
1C. Platoon formations and techniques provide security and enhance control	0.00	0.00	
1D. Squad formations provide security and enhance control	0.00	0.00	
1E. Fire team formations provide security and enhance control	0.00	0.00	
1F. Individual soldier movement maximizes cover and concealment	0.61	0.17	0.33
1G. Platoon reacts to sniper fire	0.07	0.00	0.00
1H. Soldiers take hasty firing positions	0.83	0.83	

Task 2: Assault Element Assaults the Objective Building

Subtask	Tech.	Rule	Decision
2A. SL designates entry point		0.33	0.33
2B. SL designates route to entry point		1.00	1.00
2C. Assault element or supporting weapons blow entrance through wall	0.33		
2D. (If entry point requires) Assault element enters upper story of building	0.00		
2E. Assault element enters building	0.73	0.17	1.00
2F. SL marks the entry point	0.00		
2G. Team covers staircases and other routes leading to upper and lower stories		0.33	

Task 3: Support Element Provides Fire Support for the Assault Force Entry of Building

Subtask	Tech.	Rule	Decision
3A. SL assigns each soldier and key weapon a target or area to cover			0.67
3B. Support element maintains continuous communications with and observation of the assault element.	0.00		
3C. Support element suppresses/kills enemy within the objective building and adjacent buildings	0.00	0.00	
3D. SL repositions soldiers and weapons, if necessary, to prevent withdrawal, reinforcement, or counter attack			0.33
3E. During the assault, the support element maintains suppressive fire	0.33		0.33
3F. During the assault, the support element obscures the enemy position with smoke	0.00		
3G. Just before the assault element enters the objective building, the support element increases the rate of fire until masked by the assault element	0.33		0.33
3H. When the assault element enters the building, the support element shifts fires to adjacent buildings and the level of the objective building not being entered (e.g., enter high, suppress low)	0.33		0.33

Task 4: Assault Element Clears the Objective Building

Subtask	Tech.	Rule	Decision
4A. Assault element clears stairs	0.22	0.00	
4B. Team clears hallways	0.83	0.83	
4C. SL directs the assault element first to clear the rooms that overlook approaches to the building		0.67	
4D. SL coordinates with other squads to be sure that friendly forces are not in adjacent rooms	0.33		
4E. Soldiers line up as close to the entry point as possible	1.00	1.00	
4F. Soldier breaches wall using demolitions (rather than door)	0.00	0.00	
4G. Soldier breaches door with demolitions (alternatives)	0.00	0.00	
4H. Soldier breaches door with weapon (alternative)	1.33	0.67	
4I. Four-member fire team enters the room	0.61	0.67	0.67
4J. Soldiers apply close-combat techniques	1.07	1.17	1.00
4K. Soldiers apply close combat techniques under limited visibility conditions	0.00		

Subtask	Tech.	Rule	Decision
4L. Mark cleared room	0.00		
4M. SL rotates fire teams as necessary	0.00		0.00
4N. After all rooms have been cleared, squad consolidates and reorganizes	0.07	0.00	

Task 5: Defend Building during MOUT (Daylight)

Subtask	Tech.	Rule	Decision
5A. PL designates area for observation post (OP); squad leader selects specific position			0.00
5B. Platoon installs tactical obstacles (e.g., protective wire)	0.00		0.00
5C. PL develops fire support plan	0.00		
5D. PL assigns sectors of fire, engagement priorities, and fire control measures	0.00		0.00
5E. Soldiers select fighting positions	0.42	0.22	
5F. Gunners prepare range cards	0.00	0.00	
5G. Squad leaders prepare squad sector sketches	0.00	0.00	
5H. PL prepares platoon sector sketch	0.00	0.00	
5I. Soldiers prepare defensive positions	0.11	0.17	
5J. Platoon engages enemy	0.00	0.00	0.00
5K. Platoon continues to defend or PL requests permission to withdraw			0.00
5L. Platoon consolidates and reorganizes	0.07	0.00	

Task 6: Defend a Building during MOUT at Night (Modification to Daylight)

Subtask	Tech.	Rule	Decision
6A. PL positions listening posts (LPs) and directs patrols into open areas covered by observation during daylight	0.00		0.00
6B. Weapons move to alternate positions	0.67		
6C. Gunners mark TRPs for limited visibility (e.g., glint tape, thermal tape, budd lights, chemlites)	0.00		
6D. Platoon emplaces early warning devices	0.00		
6E. Platoon engages enemy under limited visibility conditions	0.33	0.00	

Simulator: SVS (Treadmill)

Task 1: Perform Movement Techniques in MOUT

Subtask	Tech.	Rule	Decision
1A. PL directs formation and movement technique appropriate for METT-T			0.00
1B. Routes and techniques provide cover from most likely enemy positions			0.00
1C. Platoon formations and techniques provide security and enhance control	0.00	0.00	
1D. Squad formations provide security and enhance control	0.00	0.00	
1E. Fire team formations provide security and enhance control	0.00	0.00	
1F. Individual soldier movement maximizes cover and concealment	0.67	-0.17	0.67
1G. Platoon reacts to sniper fire	0.00	0.00	0.00
1H. Soldiers take hasty firing positions	0.58	0.33	

Task 2: Assault Element Assaults the Objective Building

Subtask	Tech.	Rule	Decision
2A. SL designates entry point		0.33	0.33
2B. SL designates route to entry point		0.67	0.67
2C. Assault element or supporting weapons blow entrance through wall	0.33		
2D. (If entry point requires) Assault element enters upper story of building	0.00		
2E. Assault element enters building	0.47	0.00	0.67
2F. SL marks the entry point	0.00		
2G. Team covers staircases and other routes leading to upper and lower stories		0.33	

Task 3: Support Element Provides Fire Support for the Assault Force Entry of Building

Subtask	Tech.	Rule	Decision
3A. SL assigns each soldier and key weapon a target or area to cover			0.00
3B. Support element maintains continuous communications with and observation of the assault element.	0.00		
3C. Support element suppresses/kills enemy within the objective building and adjacent buildings	0.00	0.00	
3D. SL repositions soldiers and weapons, if necessary, to prevent withdrawal, reinforcement, or counter attack			0.33
3E. During the assault, the support element maintains suppressive fire	0.00		0.00
3F. During the assault, the support element obscures the enemy position with smoke	0.00		
3G. Just before the assault element enters the objective building, the support element increases the rate of fire until masked by the assault element	0.00		0.00
3H. When the assault element enters the building, the support element shifts fires to adjacent buildings and the level of the objective building not being entered (e.g., enter high, suppress low)	0.00		0.00

Task 4: Assault Element Clears the Objective Building

Subtask	Tech.	Rule	Decision
4A. Assault element clears stairs	0.33	0.00	
4B. Team clears hallways	0.00	0.00	
4C. SL directs the assault element first to clear the rooms that overlook approaches to the building		1.00	
4D. SL coordinates with other squads to be sure that friendly forces are not in adjacent rooms	0.33		
4E. Soldiers line up as close to the entry point as possible	0.33	0.67	
4F. Soldier breaches wall using demolitions (rather than door)	0.00	0.00	
4G. Soldier breaches door with demolitions (alternatives)	0.00	0.00	
4H. Soldier breaches door with weapon (alternative)	1.00	0.67	
4I. Four-member fire team enters the room	0.55	0.60	0.33
4J. Soldiers apply close-combat techniques	0.93	0.83	1.00
4K. Soldiers apply close combat techniques under limited visibility conditions	0.17		

Subtask	Tech.	Rule	Decision
4L. Mark cleared room	0.00		
4M. SL rotates fire teams as necessary	0.33		0.33
4N. After all rooms have been cleared, squad consolidates and reorganizes	0.13	0.33	

Task 5: Defend Building during MOUT (Daylight)

Subtask	Tech.	Rule	Decision
5A. PL designates area for observation post (OP); squad leader selects specific position			0.00
5B. Platoon installs tactical obstacles (e.g., protective wire)	0.00		0.00
5C. PL develops fire support plan	0.00		
5D. PL assigns sectors of fire, engagement priorities, and fire control measures	0.00		0.00
5E. Soldiers select fighting positions	0.42	0.33	
5F. Gunners prepare range cards	0.00	0.00	
5G. Squad leaders prepare squad sector sketches	0.00	0.00	
5H. PL prepares platoon sector sketch	0.00	0.00	
5I. Soldiers prepare defensive positions	0.11	0.17	
5J. Platoon engages enemy	0.17	0.17	0.00
5K. Platoon continues to defend or PL requests permission to withdraw			0.00
5L. Platoon consolidates and reorganizes	0.00	0.00	

Task 6: Defend a Building during MOUT at Night (Modification to Daylight)

Subtask	Tech.	Rule	Decision
6A. PL positions listening posts (LPs) and directs patrols into open areas covered by observation during daylight	0.00		0.00
6B. Weapons move to alternate positions	0.67		
6C. Gunners mark TRPs for limited visibility (e.g., glint tape, thermal tape, budd lights, chemlites)	0.00		
6D. Platoon emplaces early warning devices	0.00		
6E. Platoon engages enemy under limited visibility conditions	0.50	0.00	